

Original research article

Population Density on Types of Waste Disposal in Malang City

Lirofiatillah, Rina Fiji Lestari, Sugi Hartono and Sueb

Biology Department, Mathematics and Natural Science Faculty, Universitas Negeri Malang

*Corresponding author

Email: sueb.fmipa@um.ac.id

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Abstract

The population growth in Indonesia experiencing a very high development, causing population density. This study aims to know about environmental conditions, the density of population and waste disposal in Malang city and effect between population density and types of landfills. The method was an observational study using observation, questionnaire and closed interview guidelines. The results of this study were (1) the environmental conditions categorized good, (2) the average population density is 175,814 people per square km, (3) 63.33% respondents road throw domestic waste and not processed. (4) the population density variable does not influence the type of waste disposal.

1. INTRODUCTION

Urban environmental conditions can affect the local, regional and global environment. Most levels of public health, sanitation, and waste management are problems in the urban environment (Alidoust *et al*, 2014). This condition occurs because the population in urban areas is very dense. Based on data from Badan Statistik Indonesia (2013) stated that the population in 2010 was 238.5 million and would increase 305.6 million in 2035. The population density in Indonesia did not occur in all provinces, because many residents lived in Java.

Increasing population, economic growth, urbanization, and industrial growth have led to an increase in the amount of waste produced (Srivastava *et al*, 2014). Waste management used so far is providing plastic bags, trash bins that distinguish organic and inorganic waste and recycled waste (Awomeso *et al*, 2010). If not handled, solid waste can disturb the community due to the odor produced. Additionally, it can lead to an unhealthy environment and disease (Yoda *et al*, 2014).

Based on research conducted by Liu & Yamauchi (2014) concluded that population density in Indonesia increases every year which has an impact on the level of education,

economic needs, and employment. Kinobe et al, 2015 concluded that the recycled waste is only 7.3% while the rest is only collected at the final disposal site. This is because the need for operating and maintenance costs continue to increase without being offset by the receipt of adequate retribution.

Related to the actual problems faced by big cities in Indonesia, then waste management becomes an important part of efforts to create a climate conducive city. Like the big cities in Indonesia, the city of Malang cannot be separated from the classic problems related to waste. The large population, limited land functions and high levels of consumption resulted in the accumulation of rubbish in various corners of the city. Based on the existing problems, this study aims to determine the population density on the type of waste disposal in Malang City.

2. MATERIALS AND METHODS

Research Types and Approaches

In this study, using a quantitative approach because of the research data in the form of numbers and analysis using statistics. The method used in this study is a survey method with correlational analysis, by collecting data on environmental knowledge obtained through observation and questionnaires.

3. RESULTS AND DISCUSSION

Based on the results of observations this is data about the environmental condition in Malang.

Table 1. Environmental Condition of Malang

No	Questions	Scale					Score		
		Strong	5	4	3	2		1	Weak
1	I feel that clean water is available in large quantities.	Strong	√					Weak	5
2	I feel the price of clean water is affordable	Strong		√				Weak	4
3	Green open land is very beneficial for the environment	Strong	√					Weak	5
4	I have green open land	Strong				√		Weak	2
5	With the presence of green open land can reduce the area of the house.	Strong		√				Weak	3
6	I feel my home environment to be comfortable in the presence of green open land.	Strong	√					Weak	5
Total									24

Research Time and Location

This research was conducted on March 24, 2016, at Terusan Surabaya, Lowokwaru Subdistrict, Malang City.

Population and Research Sample

The population in this study were all communities, houses, and trash in Malang, Malang. In this study, the number of respondents was 30 people and the building area was 30 houses, the researcher used a sampling technique in the form of probability sampling, namely simple random sampling.

Data collection technique

Data obtained from Observation is a method used to find out the object to be observed, namely the environmental conditions and types of waste disposal in every house on the Malang, Malang. The questionnaire was used to obtain data on population density and type of solid waste disposal on the Malang, Malang.

Data analysis

Data were analyzed using linear regression (if data is normal and homogeneous). If the data is abnormal and homogeneous logistic regression is used. With the criteria: population density as variable X and type of waste disposal as variable Y.

The results of the percentage of environmental conditions in Malang are then compared with the interpretation criteria (Riduwan, 2003).

Table 2. Percentage and Criteria

No.	Percentage	Criteria
1	0%-20%	very weak
2	21%-40%	Weak
3	41%-60%	Enough
4	61%-80%	Strong
5	81%-100%	Very strong

Based on Table 2 it can be seen that it has strong environmental conditions with a percentage of 80% which can be said that the environmental conditions are strong or good. This is because it has adequate water and green open land conditions for the community

Table 3. Ways of Waste Disposal Malang

No	Questions	Scale					Score		
		Strong	5	4	3	2		1	weak
1	In my house, there is an adequate trash can	Strong		√				Weak	4
2	In my house the trash can is divided into organic and inorganic waste	Strong		√				Weak	4
3	distinguished types of waste making it easy to process	Strong		√				Weak	4
4	I use organic waste as compost	Strong			√			Weak	3
5	The waste that I still use is recycled	Strong			√			weak	3
	Total								18

Based on Table 3 it can be seen that 72% of solid waste disposal in Malang can be said that the solid waste disposal is strong or good. Each house is provided with 2 bins, which are distinguished according to their type, namely

organic and inorganic waste. Solid waste transportation at every house is carried out every day by the solid waste disposal officer.

Table 4. Environmental Conditions based on the NEP Scale

No	Statement of	Answer					Average	N
		SS	S	N	TS	STS		
1	I feel that clean water is available in great quantities.	11	19	0	0	0	4.36	30
2	I feel the price of clean water is affordable.	7	20	3	0	0	4.13	30
3	Green open land is very beneficial for the environment.	13	16	1	0	0	4.4	30
4	I have green open land.	3	20	4	3	0	3.76	30
5	With the presence of green open land can reduce the area of the house.	3	23	1	3	0	3.86	30
6	I feel that my home environment is comfortable with green open land.	8	21	1	0	0	4.23	30

The mean value is then analyzed with the assumption based on Aldrich et al in Sookram (2013) if the average NEP <2.8 shows a bad

environmental condition if the average score is 2.8-3,2 shows the existence of sufficient environmental conditions, while if the mean

>3.2 shows very good environmental conditions. Based on these assumptions it can be concluded that out of 6 scales shows that the environmental conditions on Malang are very good, where clean water is available, there is green open land and the house feels comfortable.

Table 5. Calculation of population density

Total	378	0.00215
Average		175814

The results of these calculations are then analyzed by way of comparison with Government Regulation Number 56 / PRP / 1960 dividing the classification of population density, namely.

Table 6. Population Density

Population density per square kilometer	Regional group
a. until 50	not densely populated
b. 51 to 250	less densely populated
c. 251 to 400	quite densely populated
d. 401 Above	very densely populated

Population density can be indicated by the number of occupants per person and the area of the house in units of area (km²). Based on observations the average population density is 175,814 people per square km. This result is obtained from the population divided by area (km²), namely 378: 0.00215 = 175.814. So it can be said that the population in Malang is very crowded.

Table 7. Number of Waste Disposal

No.	Statement	Frequency of response				Percentage of answers			
		Very many	Many	little	Very little	Very little	lot	a little	Very little
1.	Do you throw a lot of solid waste everyday?	1	19	10	0	3.33%	63.33%	33.33%	0%

Table 8. Waste Management

No.	Statement	Frequency of answer		Percentage of answers	
		Yes	No	Yes	No
2.	Do you process waste in your house?	11	19	36.6%	63.3%

63.3% said they did not manage the waste in their house. Who stated that disposing of solid waste in their homes was only 11 respondents with a percentage of 36.6% stating that they managed the waste in their homes. With this significant difference, it can be concluded that most people in Malang do not manage their waste.

Based on Table 8, it can be seen that as many as 19 respondents with a percentage of

Table 9. Ways to Manage Waste

No.	Statement	Frequency of answer			Percentage of answers		
		Recycling	composting	discarded	Recycling	composting	Discarded
3.	if processed, how do you cultivate?	8	3	19	26.7%	10%	63.3%

Based on Table 9 showed that as many as 19 respondents with a percentage of 63.3 % said they did not manage the waste in their house. This is also supported by the statement that 19 respondents with a percentage of

63.3% just throw solid waste, while 11 respondents who stated managing waste stated 8 people with a percentage of 26.7% manage waste by recycling, while 3

respondents with a percentage of 10% manage waste by composting.

Table 10. Availability of Type of Trash

No.	Statement of	Frequency answers		Percentage of answers	
		Yes	No	Yes	No
4.	Are there organic and inorganic bins in your home?	19	11	63,3 3%	36,6 6%

Based on Table 10, it can be seen that as many as 19 respondents with a percentage of 63.3% stated that the trash in their homes is distinguished between organic and inorganic. While 11 respondents stated that the percentage of 36.66% stated that the trash in their house is not differentiated between organic and inorganic.

Table 11. Types of Waste Disposed

No.	Statement of	Frequency of answer			Percentage of answers		
		Plastic waste	Domestic waste	Paper	Plastic waste	domestic waste	Paper
5.	What waste do you often waste?	12	18	0	40%	60%	0%

Based on Table 11, it can be seen that as many as 12 respondents with a percentage of 40% stated that solid waste that is disposed of every day is plastic waste, 18 respondents with a percentage of 60% stated that solid waste is disposed of every day, namely domestic waste, while no respondent stated that disposing of paper waste. From these results, it can be concluded that most people in Malang throw away domestic waste.

Based on the results of linear regression analysis the R-value which is a symbol of the correlation coefficient value is 0.355. This value can be interpreted that the relationship between the two research variables is in the weak category. Through this table also obtained the value of R Square or the coefficient of determination (CD) which shows how well the regression model is formed by the interaction of independent variables and dependent variables. The CD value obtained is 12.6% which can be interpreted that the independent variable X1 has a contribution effect of 12.6% on the Y variable and the other 87.4% is influenced by other factors outside the X1 variable.

The third table is used to determine the level of significance or linearity of regression. The criteria can be determined based on the F test or the significance value test (Sig.). The

easiest way with the Sig test, with the provisions: if the value of Sig. <0.05, the regression model is linear, and vice versa. Based on the third table, the Sig. = 0.055, which means> significant criteria (0.05), thus the regression equation model based on research data is not significant, meaning that the linear regression model does not meet the linearity criteria. Based on these results Ho was accepted and Hi was rejected. This means that the population density variable did not affect the type of waste disposal in Malang. The fourth table informs the regression equation model: $Y = 3,475 + 3,402 X_1$.

4. DISCUSSION

Based on the results in table 1, environmental conditions are quite good with a percentage of 80%. Where each house has 2 bins available to distinguish between organic waste and inorganic waste. This is also done in Jakarta and Bogor based on research conducted by Yudistirani et al., (2015) stating that organic and inorganic waste must be sorted first and its management involves housewives. However, not all communities are willing to sort waste, and recycle waste so that socialization is needed to increase public understanding (Taufiq & Maulana, 2015).

Based on table 2, the observation data to find out the method of solid waste disposal in Malang by 72%, which means that the method of solid waste disposal is good. Where solid waste is collected in two different trash bins between organic and inorganic then every day will be transported by the solid waste transport officer. This attitude appears because of the intention of the people who want to dispose of solid waste in a distinguished way, this depends on the level of education and the type of work of the surrounding residents (Fearon & Adraki, 2014). This is also supported by the study of Lee & Paik, (2011) that environmental attitudes affect recycling and waste management behavior. Based on the results of the average observation of environmental conditions based on the NEP scale in table 3, the environment on Malang is very good because of its average >3.2. Because there is still clean water and green open land. The housing environment is quite comfortable and not too noisy.

Based on observations the average population density is 175,814 people per square km, so it can be said that the population in Malang is very crowded. Because population density is followed by waste generated. There are studies that facilitate the collection of waste, namely a study conducted by Apaydin & Gonullu, (2011) that a container device can estimate collection time based on population density per distance in 100 m

Based on table 5, the amount of solid waste disposal in Malang is high. This is indicated by the number of respondents who stated that they throw away a lot of solid waste around 63.33%. Disposal of solid waste in large quantities is due to residents having food stalls and shops in their homes so that the production a lot of waste. In addition, with the same percentage, 63.33% of the people who disposed of solid waste also did not manage their solid waste and only threw it in the solid waste. The attitude of the inhabitants of this city causes major damage to the ecosystem and they are not aware that in processing

waste poorly it will also cause a bad environment (Asuquo, I et al, 2012). As for those who only process 10%, the waste is processed for compost fertilizer.

5. CONCLUSION

Based on the discussion of the population density on the type of solid waste disposal in the city of Malang, it can be concluded that: (1) The environmental conditions in Malang are good, (2) The average observation of population density is 175,814 people per square km. (3) In our observations, 63.33% of respondents throw domestic waste and not processed, and (4) the population density did not influence the type of waste disposal in Malang.

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