

Data Mining Rough Set Method In Analyzing Communities Disposing of Garbage in Rivers

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ABSTRACT

The waste management approach is a worldwide problem and is often neglected. The situation in urban areas is worse than in rural areas. It is a big challenge to deal with this dilemma, therefore, the management of a better management system is inevitable. The input data used in this study included the community's last educational data and social stratification, both through questionnaires and interviews with the community. Furthermore, the data that has been presented in the decision system is collected or eliminated for each object that has the same attributes, then summed and collected into the same class so that the cleaning technique process becomes simple (equivalent class). The Advanced Discernibility Matrix and the Discernibility Modulo D Matrix will compare a collection of attributes based on the equivalence class that will be modeled with the last Education modeled "A", the social stratification of society is modeled "B". The reduction results obtained reveal that there are several reasons why people throw garbage in the river. This provides information, the latest differences in social stratification and education can influence people's mindset and habits of disposing of garbage. The social stratification of people who are not from the wealthy class and have the last elementary-junior high school education contributes more negatively to the fullness of the river flow with garbage.

Keywords: Rough Set; Rubbish; River; Education; Stratification

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1. INTRODUCTION

Nowadays, 4.0 industry environment and circular economy are paradigm shifts for the industry. More and more machines will be used and the capability to maintain the machines become vital. Circular economy is an economic system in focus of reducing and eventually eliminating waste [1]. The disruption of information technology has caused many sectors in the industry to experience a series of changes on the market offer and demand. Integrated information technology is expected to facilitate test and support of associated role in a availability and accessibility to enhance work flow in the area [2]. Work becomes faster and easier. This includes the increasing use of technology in analyzing people's behavior in waste management. Talking about waste is never ending, because over day humans always interact with garbage. Garbage is the result of human activities that produce waste [3]. Garbage is indeed an endless problem for cities. Tons of waste generated from households, shops, markets, factories and so on, need proper management. Not only to make the city look clean and tidy, but also to create a healthy environment free from disease and odor pollution [4]. The waste management approach is a worldwide problem and is often neglected. Even the level of waste production is increasing at the rate absorbed in both developed and underdeveloped countries. The situation in

urban areas is worse than in rural areas. It is a big challenge to deal with this dilemma, therefore, it is inevitable to manage a better management system [5].

In Indonesia, based on data from the Ministry of Environment and Forestry's National Waste Management Information System (SIPSN), the volume of waste generated in Indonesia in 2022 will reach 19.45 million tons. Of this amount, the majority or 39.63% came from household waste generation. The next largest source of national waste generation comes from commerce, which is 21.07%. The city of Padang produces around 640 tons of waste per day. According to the Director of the Indonesian Forum for the Environment (WALHI) West Sumatra, Uslaini, predicts that West Sumatra will be overwhelmed in 2023 because the Final Disposal Site (TPA) in Aie cold will be overloaded at the end of the year. Organic and recyclable waste has not been managed properly, so most of it ends up in landfills [6,7]. When the generation of waste that goes to the landfill is increasing day by day, a very good landfill management is needed. The quantity of waste continues to increase along with the increasing variety of consumption patterns and the increasing population [8].

Community culture and habits in waste management starting from the source to the TPS and TPA where there is often no segregation/classification based on the type of waste, so that the recapitulation of waste calculations is carried out by weighing the garbage trucks on the weighbridge available at the TPA. Another phenomenon is that there are still people who throw garbage into the river because the settlements are close to the river [9]. The community has not yet realized that good and correct waste management is the main capital in waste management [10]. Garbage can cause bad environmental pollution which can be a threat to the surrounding community, such as becoming a breeding ground for mosquitoes, causing malaria, and dengue fever due to garbage accumulation [11].

The current waste problem is not something to be taken lightly, the waste problem has become a serious problem. Many disasters that occur are related to waste. Waste if not handled properly and correctly from the source will cause health, social, economic and beauty problems [12, 13]. The most shocking event recently, on Wednesday, October 19 2022, was a major disaster at the Final Disposal Site (TPA) Piles of garbage at the Cipayung Waste Disposal Site (TPA) on Cipayungjaya Agricultural Road, Depok, West Java, landslides and closed canals to cause flooding. The landslide occurred because the pile of garbage that had exceeded its capacity (overload) was washed down by heavy rain. According to local residents, the garbage storage at the Cipayung TPA, Depok, has a capacity of 2 million cubic. As for the time before the landslide the garbage exceeded capacity [14]. In addition, the Bogor district Regional Disaster Management Agency reported that it had evacuated trees and trash, on Sunday, August 28, 2022. This is a BPBD work step due to high-intensity rain, fallen fragile tree trunks and piled up trash, blocking the river flow Kalibaru. There was also flooding caused by the large amount of community waste that did not comply with the rules for disposing of waste in its place [15].

Several points in the Sustainable Development Goals or SDGs, such as healthy and prosperous lives, proper sanitation, sustainable cities and communities, climate action so that serious problems do not occur and cause various disasters, which are sustainable development goals compiled by the United Nations (PBB) must make maximum efforts in order to maintain the quality of the environment and the implementation of governance, can maintain the improvement of the quality of life for the welfare of people around the world [16]. Clean behavior is a series of various forms of behavior/action towards waste management. For example, behavior that pollutes the environment as an irresponsible action or an action to protect the environment as one that is responsible. Clean behavior can be expressed as an action or response in environmentally responsible behavior to protect the environment. Individuals who have knowledge, skills, positive attitudes towards the environment and towards pro-environmental behavior, usually tend to have responsible behavior [17]. People do not realize that they are part of this universe so that the environmental crisis has not become a common concern. Indeed, humans are part of the environment. Both interact within and ecosystem. Humans must try to be able to regulate and control themselves to do something that is socially acceptable to the environment and avoid behavior that can damage the environment.

The research was carried out deliberately to look at the main source of the community's habit of throwing garbage, especially into rivers which are increasingly common nowadays, resulting in a buildup of it all the way to the beaches and oceans. This habit occurs continuously and increasingly extends to other communities. Various factors can influence the habit of throwing garbage into the river, including internal and external factors. Internal factors are education, concern for waste, and knowledge about waste, while external factors are regulations, guidance and counseling, environmental conditions, and facilities [18].

The Rough Set method can be used as a mathematical tool for dealing with ambiguity and uncertainty and has been successfully applied in a variety of tasks, such as feature selection, extraction, rule synthesis, classification, knowledge discovery, and others. The use of this method is by setting sample criteria based on the community's social stratification and the community's latest educational background, which of these criteria can be seen why people still throw garbage into the river. By building a rule or data mining rules so that new knowledge is obtained from the extraction process (Data Mining). Supported by the Rough Set method which

is one part of Artificial Intelligence, researchers try to make certain patterns of rules and test the final decision making that causes people to throw garbage into the river.

2. RESEARCH METHOD

The input data used in this study included the community's last education data and community social stratification, both through questionnaires and interviews with the community. Furthermore, the data that has been presented in the decision system is grouped or filtered for each object that has the same attribute criteria, then summed and grouped into the same class so that the cleaning technique process becomes simple (equivalent class). The Advanced Discernibility Matrix and the Discernibility Modulo D Matrix will compare a set of attributes based on the equivalence class that will be modeled with Social Stratification modeled "A", and Last Education modeled "B". This stage aims to get the results of the system based on the selection of reduced attributes from a set of condition attributes using prime implicants of Boolean functions from the Discernibility Modulo D Matrix. people throw garbage in the river.

Based on a test instrument of 10 questions validated using SPSS version 23, 20 are all valid and reliable. From a sample of 30 answers chosen randomly, to fulfill the answers to the given behavior, 2 (two intervals), namely if the total answers are less than or equal to 10 then the social stratification sample is poor, whereas if the total score exceeds 10 then the social stratification sample is wealth.

Table 1. Social Stratification Test Interval

Interval	Indicator
≤ 10	P
> 10	W

Table 2. Last Education Test Interval

Interval	Indicator
≤ 8	Elementary-Junior High School
8 < x ≤ 16	Senior High School-Bachelor Degree
> 16	Graduate-Postgraduate

Based on the test instrument, 27 questions were validated using SPSS version 23, 25 questions were valid and reliable. From a sample of 30 answers that were randomly selected, to fulfill the answers to the given social stratification, 3 (three intervals), that is, if the total answers are less than or equal to 8 then the sample has a last education of Elementary to Junior High School, whereas if the total score exceeds 8 and is less or equal to 16 then the example is Senior High School to Bachelor Degree. Meanwhile, if the total score exceeds 16, then the sample has an Graduate-Postgraduate.

Furthermore, using the Rough set shows these two things which are information systems in Microsoft Excel. Rough sets offer two forms of data presentation, namely information systems (SI) and decision systems (SK) where "U" consists of numbers "{c1, c2, c3, ..., Cm}" as objects such as {object 1, object 2, object - n} and "A" {a1,, a2,, ..., an}.

Table 3. Information Systems

Num.	Name	Stratifikasi Sosial	Pendidikan Terakhir
1	PBS1	W	Elementary
2	PBS2	P	Elementary
3	PBS3	P	Elementary
4	PBS4	P	Elementary
5	PBS5	P	Senior High School
6	PBS6	P	Bachelor Degree
7	PBS7	P	Senior High School
8	PBS8	P	Bachelor Degree
9	PBS9	P	Senior High School
10	PBS10	P	Senior High School
...
30	PBS30	W	Graduate

3. RESULTS AND DISCUSSION

From the method used in the research, the results are in the form of a decision system. The decision system from the process of classifying and sorting data sets, obtained as many as 7 decisions. From the existing decisions, it is made in the elaboration of the matrix model form.

Tabel 4. Decision Systems

Num.	Name	Social Stratification	Last Education	Throw Garbage in the River
1.	PBS1	P	Elementary-Junior High School	Y
2.	PBS2	P	Senior High School-Bachelor Degree	Y
3.	PBS3	P	Senior High School-Bachelor Degree	N
4.	PBS4	P	Graduate-Postgraduate	N
5.	PBS5	W	Elementary-Junior High School	Y
6.	PBS6	W	Senior High School-Bachelor Degree	Y
7.	PBS7	W	Elementary-Junior High School	N

Tabel 5. Matrix Model

Class	Condition Attribute		Atribut Keputusan
	A	B	Throw Garbage in the River
EC1	1	1	1
EC2	1	2	1
EC3	1	2	2
EC4	1	3	2
EC5	2	1	1
EC6	2	2	1
EC7	2	1	2

Tabel 6. Discernibility Matrix

Class	EC1	EC2	EC3	EC4	EC5	EC6	EC7
EC1	X	B	B	B	A	AB	A
EC2	B	X	X	B	AB	A	AB
EC3	B	X	X	B	AB	A	AB
EC4	B	B	B	X	AB	AB	AB
EC5	A	AB	AB	AB	X	B	B
EC6	AB	A	A	AB	B	X	B
EC7	A	AB	AB	AB	X	B	X

Tabel 7. Discernibility Modulo D Matrix

Class	EC1	EC2	EC3	EC4	EC5	EC6	EC7
EC1	X	X	B	B	X	X	A
EC2	X	X	X	B	X	X	AB
EC3	B	X	X	X	AB	A	X
EC4	B	B	X	X	AB	AB	X
EC5	X	X	AB	AB	X	X	B
EC6	X	X	A	AB	X	X	B
EC7	A	AB	X	X	X	B	X

Based on the matrix, the results of the reduction are 3 general rules, which are as follows:

1. {Social Stratification, Last Education} = {A,B},
2. {Social Stratification, Last Education}, {Last Education} = {A,B}, {B}, and
3. {Social Stratification}, {Social Stratification, Last Education} = {A}, {A,B}.

After obtaining 3 reduction results, it can be concluded that there are 3 general rules obtained from this study. The general rules are as follows:

1. Social Stratification (Poor) OR Last Education (Elementary-Junior High School) \implies Dispose of Garbage in the River (Yes),
2. Social Stratification (Poor) AND Last Education (Senior High School-Bachelor Degree) OR Last Education (Graduate-Postgraduate) \implies Throw Garbage in the River (Yes), and
3. Social Stratification (Wealth) OR Social Stratification (Wealth) AND Last Education (Elementary-Junior High School) \implies Throw Garbage in the River (No).

4. CONCLUSION

The reduction results obtained reveal that there are several reasons why people throw garbage in the river. This provides information, the latest differences in social stratification and education can influence people's mindset and habits of disposing of garbage. The social stratification of people who are not from the wealthy class and have the last elementary-junior high school education contributes more negatively to the fullness of the river flow with garbage. For further studies in order to obtain studies and other factors causing people to throw garbage in the river, the researchers hope that there will be further, more in-depth research. Because research prospects like this are of course very useful if they are investigated further and broadly. And of course a follow-up is needed from the results of this research so that the environment is better maintained and maintained in the future.

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