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Decision Making System While the Garbage Shelter Using Multiple Attribute Fuzzy Decision Making

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Abstract

It is recognized that the choice of location Discharge the Waste Temporary are complicated considering the many factors to consider. It is therefore necessary criteria that can be used to determine the proper waste sites and meet the requirements. The requirement was confirmed in the Indonesian National Standard (SNI) 03-3241-1994 about election procedures landfill. This study is based on regional stages, where the stages to produce a map that shows the area within the planning area is divided into several zones eligibility. Simple Additive Weighting makes it easy to perform data analysis for decision making is very good, good and less good a selected location.

Keywords: DSS, Garbage dump, SAW

I. INTRODUCTION

Trash is one of the biggest problems in this country, on the river, the streets and even in our homes any bias we find garbage is usually derived from the waste or household waste. Coordinator of Community Activists Art evac Wilderness and Environment explained that the presence of TPA Brits violates Regulation No. 81 of 2012 Article 23 paragraph 3 letter e, about the distance of the settlement to the landfill. Really landfill is not feasible. Given the distance must be at least 1 KM of settlement. So its presence should be reassessed.[1]

Aldi Fachrial et. all (2017) the use of a decision support system can be used to help humans make decisions quickly, accurately and consistently, this system was developed by applying Simple Additive weighting method, a method known as weighting method, the results of this system a ranking of the best landfill to the lowest value, from the above description of this decision support system can assist communities in determining the landfill properly [2]. Ni Kadek Ariasih et. all (2015). in this research collated by regional stages, where the stages to produce a map that shows areas in the region which is divided into Max planning Fuzzy Interference facilitate the conduct data analysis for decision making decent, decent enough and not worthy of a location is selected. to determine the trash while, society should help determine the right places to be made in landfills while[3].

In previous research on garbage shelter there are some methods that are used, Agus Rachmat et. all Purnama (2011) to achieve the service levels of the TPS allocation of 80% is achieved by purchasing three new dump trucks and 10 new trucks roll arm in planning first, in planning the 3rd (2013) do construction 5 units of waste management 3R because of limited land and in planning the 4th do investment expansion of the landfill area of 5 ha, so in planning the first, third and fourth allocation cost management garbage rose precipitously, while in the planning of the 2nd and 5th because no investments that do so cost management allocations are within reasonable range between 8-100 billion.

Based on the above problems that has been described then make the decision-making system of landfills while using Fuzzy Multiple attribute Decision Making to help solve community problems, with so will be easier for people to dispose of waste in places that are supplied. Research carried out aims for how to design and build a system of decision-making with Fuzzy Decision Making Multiple attribute to assist in the resolution of the people who need temporary landfills District of performances. Based on the above problems can be formulated problem is how to apply the methods of Fuzzy Multiple attribute Decision Making in the system of decision making temporary landfills.

II. THEORY

2.1. Decision Support System

Kusrini (2007) Decision Support System is a system that providing information interactive

information, modeling, and data manipulation. The system is used to assist decision-making in situations of semi-structured and unstructured situations, where no one knows for sure how the decision should be made[4]. Turban et. all (2005) Decision support systems are merging individual intelligence sources with component capabilities to improve decision quality. Decision support system is also a computer-based information system for management decision-making that address issues of semi-structured[5],[6].

2.2. Fuzzy Multple Attribute Decision Making

Fuzzy Multiple Attribute Decision Making (FMADM) is a method used to find the optimal alternative of a number of alternatives with certain criteria. The essence of FMADM is determining weights for each attribute value, then drawn ed out by with process's estimation that will select the alternative that has been given. Basically there are three approaches to find the weight values of attributes, namely the approach of looking for value attributes, that the subjective approach, objective approach and an integrated approach between the subjective and objective. Each approach has excess and weaknesses. In the subjective approach weight value is determined based on the subjectivity of the decision makers, so that some of the factors in the process of ranking the alternative bias freely determined[7]

2.3. Definition of Trash

According to the Head of Department and Administration of Palembang, (1999) waste is solid waste that is made up of organic waste, inorganic waste and trash B3 deemed no longer useful and should be managed so as not to harm the environment.

2.4. Types of Waste

Gelbert (1996) Organic waste, is waste generated from biological materials that can be degraded by microbes or biodegradable. This rubbish can easily be explained by natural processes. Household waste is mostly organic ingredients. Including organic waste, for example from kitchen garbage, food scraps, wrappers (other than paper, rubber and plastics), flour, vegetables, fruit skins, leaves and twigs. In addition, traditional markets also contributed much organic waste such as waste vegetables, fruits and others. Inorganic rubbish is rubbish generated from non-biological materials, either a synthetic product or process results mineral processing technology. Inorganic waste is divided into metal bins and other dairy products, waste plastic, waste paper, glass and ceramics trash, garbage detergents. Most inorganic nature cannot be decomposed by micro-organisms as a whole (unbiodegradable). Meanwhile, others can only be described in a long time. This type of waste at the household level, for example plastic bottles, glass bottles, plastic bags, and cans[8]

III. REASECH METHODOLOGY

3.1. Stage Data Collection

- Observation
  In this observation stage researchers conducted a direct observation of the state of the trash in the districts of performances, followed by the assessment of the shelters trash that made the object of research. From the results of these observations researchers found several landfills of alternative bins have been identified that can be used as temporary landfills, by comparing the value of any existing alternative.
- Interview Method
  In this phase, researchers conducted an approach to the public, especially people whose homes near landfills as research object to obtain a data or information needed to help determine the ratings landfills in accordance with predetermined criteria is criterion. which is by interview or interviews which then results obtained are compared with the value of any other alternatives
- Method Literature
  In this phase of the study, the authors also use the library or study methods in the form of a reference library of previous research journals. In this case I seek, learn, and summarizes a wide range of literature or journal references related to the research problems.

3.2. Simple Additive Weighting Method

Kusuma Dewi (2006) Simple Additive Weighting method is finding a weighted summation of rating performance on each alternative on all attributes. SAW method requires a process of normalizing the decision matrix (X) to a scale that can be compared with all existing alternatives rating[9][10]–[15]. Granted the following equation:

$$r_{ij} = \begin{cases} \dfrac{xij}{Max(xij)} & \text{if j is an advantage (benefit)} \\ \dfrac{Min(xij)}{xij} & \text{if j is an attribute of the cost (cost)} \end{cases} \quad (1)$$

Where:
rij = normalized performance rating
Max Xij = maximum value of each row and column
Min Xij = minimum value of each row and column
Xij = rows and columns of a matrix

With rij is the normalized performance rating of alternative Ai on Cj attributes; I = 1,2, ... m and j = 1,2, .. n
Preference value for each alternative (Vi) is given as:

$$V_i = \sum_{j=1}^{n} w_j r_{ij} \quad (2)$$

Vi = value preferences will
WJ = weight rating
rij = normalized performance rating
Vi larger value indicates that alternative Ai is selected.

Vi larger value indicates that the alternative Ai is selected. Step Completion Simple Additive Weighting (SAW):

1. Specify the criteria that will be used as a reference in the decision, namely Ci.
2. The rating determines the suitability of each alternative on each criterion.
3. Make decisions based on criteria matrix (Ci), then normalized matrix based on equations that are tailored to the type attribute (attribute or attributes benefit costs) in order to obtain the normalized matrix R.
4. The final results obtained from the ranking process is the summation of the normalized R matrix multiplication with the weight vector in order to obtain the greatest value is selected as the best alternative (Ai) as a solution[16]

Table 1. Criteria and alternative weight values tested

Criteria	Information	Value
C1	Not prone geology	15
C2	Not prone hydrogeological	15
C3	Not prone topographical	10
C4	Not prone to aviation activities at the airport	10
C5	Not a protected area or region	10
C6	preliminary stages	15
C7	phase determination	10
C8	types of waste	15
TOTAL VALUE		**100**

Source SNI 19-3241-1994

3.3. Think Framework Research

Framework think this study is to determine the landfills while at performances using simple additive weighting. The research method was carried out by identifying a problem, collecting data through observation, interviews, and study the literature. Before designing the decision support system determination waste disposal, while, do an analysis by collecting the necessary data such as a data clerk, and location data trash. Data clerk and the data used to determine the location of the officer carrying trash collection location. The data used to enter data KK houses will be monitored for further assessed based on several categories. Data criterion consists of questions in accordance with the rating category consists of several options or choices. The many choices of each question is used to determine the weight of each category of assessment.

In this case there is a category that is a means of disposal bins While strategic Should circumstances, yard, and landfills. After that the new set of weights multiplier for each category and weight calculation of each of the categories used to determine the total weight of each category and the threshold value of each category, followed by Perform data collection process of calculating the score results for each polling station in each category.

Researchers will compare the results with the limit. The threshold determination TPS is greater than or equal to 80% of the total score results of data collection. A TPS can be said to qualify if the results of the data collection obtained a total score of greater than or equal to (>) threshold, and a polling station is said to be eligible if the results of the data collection obtained a total score of smaller (<) from the threshold. Here is a description of how the assessment process until the determination of the TPS.

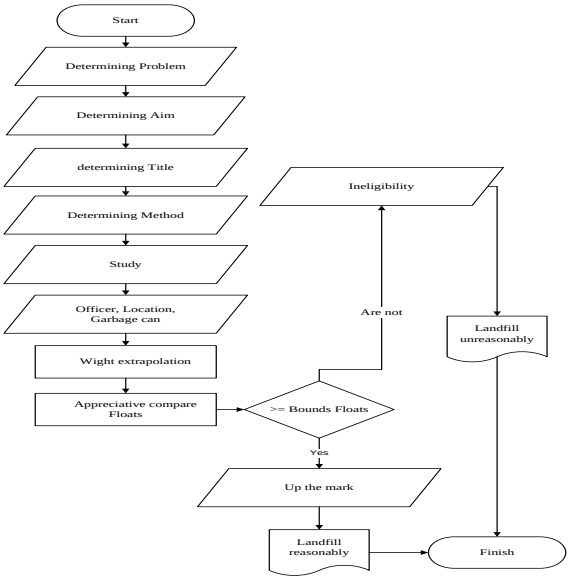

Figure 1: Flowchart Framework Research

IV. DISCUSION

From the weight values of each criterion in each alternative the matrix values are obtained as follows.

4.1. The Alternative Weighting Each Criterion

Table 2. alternative weighting each criterion

Alternative	Criteria							
	C1	C2	C3	C4	C5	C6	C7	C8
A1	0.8	0.8	0.4	1	0.8	1	0.8	1
A2	1	1	0.4	0.8	1	0.8	1	0.8
A3	0.6	0.4	0.8	1	1	0.8	1	0.8
A4	0.8	1	0.8	0.4	0.4	1	0.8	0.6
A5	1	0.8	1	1	0.8	1	1	1
A6	0.6	0.4	1	0.8	0.4	0.8	1	1

4.2. Normalization For Each Criteria

In the decision-making researchers should be able to give weight, based on the level of the quality of each individual takes the following criteria: Vector

X (15,15,10,10,10,15,10,15). Make a decision matrix x, can be seen from the table match is as follows;

$$X = \begin{matrix} 0,8 & 0,8 & 0,4 & 1 & 0,8 & 1 & 0,8 & 1 \\ 1 & 1 & 0,4 & 0,8 & 1 & 0,8 & 1 & 0,8 \\ 0,6 & 0,4 & 0,8 & 1 & 1 & 0,8 & 1 & 0,8 \\ 0,8 & 1 & 0,8 & 0,4 & 0,4 & 1 & 0,8 & 0,6 \\ 1 & 0,8 & 1 & 1 & 0,8 & 1 & 1 & 1 \\ 0,6 & 0,4 & 1 & 0,8 & 0,4 & 0,8 & 1 & 1 \end{matrix}$$

Second, make the normalization matrix Y obtained from X as follows:

$$Y = \begin{matrix} 0,8 & 1 & 0,6 & 0,8 & 1 & 0,6 \\ 0,8 & 1 & 0,4 & 1 & 0,8 & 0,4 \\ 0,4 & 0,4 & 0,8 & 0,8 & 1 & 1 \\ 1 & 0,7 & 1 & 0,4 & 1 & 0,8 \\ 0,4 & 1 & 1 & 0,4 & 0,8 & 0,4 \\ 1 & 0,8 & 0,8 & 1 & 1 & 0,8 \\ 0,8 & 1 & 1 & 0,8 & 1 & 1 \\ 1 & 0,8 & 0,8 & 0,6 & 1 & 1 \end{matrix}$$

By multiplying each column in the table with a weighting criteria that have been in declare.
Weight vector:
C1 = 15
C2 = 15
C3 = 10
C4 = 10
C5 = 10
C6 = 15
C7 = 10
C8 = 15
By using the equation:

$$V_i = \sum_{j=1}^{n} w_j \, r_{ij} \quad (5)$$

V1 = (0,8x15) + (0,8x15) + (0,4x10) + (1x10) + (0,8x10) + (1x15) + (0,8x10) + (1x15) =
(12 + 12 + 4 + 10 + 8 + 15 + 8 + 15)
= 84

V2 = (1x15) + (1x15) + (0,4x10) + (0,8x10) + (1x10) + (0,8x15) + (1x10) + (0,8x15) + =
(15 + 15 + 4 + 8 + 10 + 12 + 10 + 12)
= 86

V3 = (0,6x15) + (0,4x15) + (0,8x10) + (1x10) + (1x10) + (0,8x15) + (1x10) + (0,8x15) =
(9 + 6 + 8 + 10 + 10 + 12 + 10 + 12)
= 77

V4 = (0,8x15) + (1x15) + (0,8x10) + (0,4x10) + (0,4x10) + (1x15) + (0,8x10) + (0,6x15) =
(12 + 15 + 8 + 4 + 4 + 15 + 8 + 9)
= 75

V5 = (1x15) + (0,8x15) + (1x10) + (1x10) + (0,8x10) + (1x15) + (1x10) + (1x15) =
(15 + 12 + 10 + 10 + 8 + 15 + 10 + 15)
= 95

V6 = (0,6x15) + (0,4x15) + (1x10) + (0,8x10) + (0,4x10) + (0,8x15) + (1x10) + (1x15) =
(9 + 6 + 10 + 8 + 4 + 12 + 10 + 15)
= 74

4.3. Analysis Of Result

Of the matrix multiplication X * Y above, the obtained results as follows:

Table 3. Analysis

V1	**84**
V2	86
V3	77
V4	75
V5	95
V6	74

The value of the sum matrix above are V1 = 84 V2 = 86 and V5 = 95 so the alternative is already qualified and can be regarded as landfills while because it meets the value of the threshold in the assessment bins while it was 80% of the total results of data collection. While V5 can be called the best quality Trash with TPS alternative to the 5 region of performances

V. CONCLUSION

By using Simple Additive Weighting more effective and efficient for use in the determination of temporary garbage shelter. By using the SAW method, the choice of garbage bin locations in housing areas has very precise accuracy. so that it can help the Pringsewu district layout agency in providing assistance to areas that are recommendations from the results of this discussion. of the five alternatives tested there were three alternatives which became strong candidates in the provision of assistance for waste bins and became a strategic location to become a temporary waste dump namely alternative 5.

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