Selection of Temporary Landfill using Fuzzy Multiple Attribute

Muhamad Muslihudin, Rizky Purnama, Wahidah Hashim, Andino Maseleno

Abstract: ***It is realized that the selection of temporary landfill, bahasa: Tempat Pembuangan Sampah (TPS) is very complicated in view of many factors that need to be considered. Therefore it is needed the criteria that can be used to determine the location of landfill that is feasible and meets the requirements. The requirements are stated in the Indonesian National Standard (SNI) 03-3241-1994 about procedures for selecting landfill sites. In this study, it was arranged based on regional stages, where the stages in resulting map contain the area within the planning area divided into several feasibility zones. By using the method of Simple Additive Weighting it makes easy to perform data analysis to results very good, good and bad decisions for selected location.***

Index Terms**: Temporary landfill, simple additive weighting, fuzzy multiple attribute.**

I. INTRODUCTION

A. Background

Garbage is one of the biggest problem in Indonesia, in the river, on the street even in our home we can find the garbage usually it is from waste product or household waste. The existence of the Bumiayu Landfill violated Government Regulation No. 81 of 2012 article 23 paragraph 3 letter e, about the distance between settlements and landfill. This landfill is not feasible. Given the distance must be at least 1 kilometer from the settlement. So its existence must be reviewed [1].

The use of a decision support system can be used to help human make decisions quickly [2-4], precisely [5-7] and consistently [8-10]. This system is developed by applying the Simple Additive Weighting method, a method better known as the weighting method [11-13], the result of this system is the highest ranking of landfill to the lowest rank , from the description above. This decision support system can help the community in determining landfill properly [14]

In this study, it was arranged based on regional stages, where the stages to produce map containing areas within the planning area which were divided into Max Interference Fuzzy made it easy to carry out data analysis to produce decent decision, quite feasible and not feasible for a selected location. To determine temporary trash bin, community must help determine the right places to make temporary landfill [15].

In a previous study of temporary waste shelter there were several methods used, to achieve 80% of TPS allocation achieved by buying 3 new dump trucks and 10 new arm roll trucks in the planning year firstly, in the third year of planing. The construction of 5 units 3R waste management units was carried out due to limited land and in the 4th planning year an investment of landfill expansion of 5 ha was carried out, therefore in the first, third and fourth planning years garbage increased dramatically, while in the second and fifth planning years because there was no investment made so that the management allocation costs were within the reasonable range between 8-100 billion.

Based on the above problem that has been described, a decision-making system for temporary landfill is made using Fuzzy Multiple Attribute Decision Making to help solve community problems, so that it will make it easier for people to dispose the waste in the provided place. The research aimed at how to design and build a decision-making system using the Fuzzy Multiple Attribute Decision Making method to assist the community who need the temporary landfill in the Subdistrict of Pagelaran.

II. THEORETICAL BASE

A. Decision Support System

Decision Support System is an interactive information system that promotes information, modeling, and data manipulation [16-18]. The system is used to help make decisions in situations that are semi-structured and structured, where no one knows surely how the decision should be made [19-22].

Decision support system is a combination of individual intelligence sources with the ability of components to improve the quality of decisions. Decision support systems is also computer-based information system for the management of decision-making that deals with semi-structured problem [23]. The purposes of decision support system are:

1. To assist the manager in making decision for semi-structure problem. .
2. To Provide support at the manager's discretion and not intended to change the manager's function.
3. To Increase the effectiveness of decision taken by managers more than improving efficiency.
4. To Enable decision makers to do computation quickly with low costs.
5. To Increase productivity.

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6. Quality support.
7. Competitive
8. Overcoming cognitive limitation in processing and storage.

B. Fuzzy Multiple Attribute Decision Making

Fuzzy Multiple Attribute Decision Making (FMADM) is a method used to find optimal alternative from a number of alternatives with certain criteria. Multiple criteria decision making (MCDM) or multiple criteria decision analysis (MCDA) is a sub-discipline which deals with multiple criteria in decision environment [24][25]. The essence of FMADM is to determine the weight score for each attribute, then proceed with a ranking process that will select the alternatives that have been given. Basically there are 3 approaches to look for attribute weight score , namely approach to look for attribute score, namely subjective approach, objective approach and integration approach between subjective and objective. Each approach has strenght and weaknesses. In the subjective approach the weight score is determined based on the subjectivity of the decision makers, so that several factors in the alternative ranking process can be determined freely. Whereas in the objective approach the weight score is calculated mathematically so that it ignores the subjectivity of the decision maker[26]. Fuzzy Multiple Attribute Decision Making there are several methods used to solve FMADM problem, among others:

a. Simple Additive Weighting method (SAW)
b. Weight Product (WP)
c. ELECTRE
d. Tehnique For Order Preference by Similarity to Ideal Solution (TOPSIS)
e. Analytic Hierarchy Process (AHP)[27]

C. Definition of Waste

According to the Head of Urban Planning Office [28], Garbage Waste is solid waste consisting of organic waste, inorganic waste and B3 waste which is considered useless anymore and must be managed so as not to endanger the environment. Type of Waste to Gelbert [29]:

a. Organic waste, is waste produced from biological material that can be degraded by microbe or biodegradable. This garbage can easily be broken down through natural processes. Most household waste is organic matter. Including organic waste, for example waste from kitchen, food scrap, wrapper (other than paper, rubber and plastic), flour, vegetable, fruit peel, leaves and twigs. In addition, many traditional markets also donate organic waste such as vegetable waste, fruit and others.
b. Inorganic waste is waste produced from non-biological materials, both in the form of synthetic product and the results of the process of processing mining materials. Inorganic waste is divided into metal waste and its processed product like plastic waste, paper waste, glass and ceramic waste, detergent waste. Most inorganic substances cannot be decomposed by nature or unbiodegradable. Meanwhile, some others can only be described for a long time. This type of waste is at the household level such as plastic bottle, glass bottle, plastic bag, and can [30]

D. Landfill

According to SNI 03-3241-1994, landfill (TPA) is a physical facility for the continuity of waste disposal activities in the form of a place used to quarantine municipal waste safely [31]

III. RESEARCH METHOD

A. Data Collection Method

a. Observation Method

In this stage of observation the researcher conducted a direct observation of the state of the trash in the sub-district of Pagelaran, which was then followed by a process of assessing the garbage collection site that were used as the object of the research. From the results of these observation, researchers found several landfill from a predetermined alternative garbage can that can be used as a temporary landfill, by comparing the score of each alternative.

b. Interview Method

In this stage the researcher took an approach to the community, especially the community whose house near the landfill is the object of research to obtain the data or information needed, it is to help determine the assessment of landfill in accordance with the predetermined criteria. Then the results obtained will be compared with the score of each other alternatives.

c. Literature Research Method

In this research phase, the author also used the literature or literature study method in the form of reference from previous research journals. In this case the writer seeks, studies, and summarizes various kinds of literature or journal references related to research problem.

B. Simple Additive Weighting Method

Simple Additive Weighting method is looking for weighted sum of performance rating on each alternative on all attributes. The Simple Additive Weighting method required the process of normalizing the decision matrix (X) to a scale that can be compared with all available alternative ratings [32]

Given equation as follows :

$$r_{ij} = \begin{cases} \frac{x_{ij}}{\text{Max}(x_{ij})} & \text{if j is benefit} \\ \frac{\text{Min}(x_{ij})}{x_{ij}} & \text{if j is cost} \end{cases} \quad (1)$$

Where :

r_{ij} = normalized performance rating
Max X_{ij} = maximum score from each row and column
Min X_{ij} = minimum score from each row and column
X_{ij} = row and column matrix

With r_{ij} is normalized performance rating from Ai alternative Cj; I =1,2,...m and j =1,2,..n
at Ai attribute of preference score as follows :

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

V_i =preference score
W_J = rating weight
r_{ij} = normalized performance rating

A larger Vi score identified that the alternative Ai was more selected.
A larger Vi score indicated that the Ai alternative was more selected. Stages for Simple Additive Weighting Completion :

1. Determine the criteria that will be used as a reference in making decision, namely Ci.
2. Determine the compatibility rating of each alternative on each criterion.
3. Create a decision matrix based on criteria (Ci), then normalize the matrix based on equation adjusted for the type of attribute (attribute gain or cost attribute) so that the normalized R is obtained.
4. The final results are obtained from the ranking process, namely the sum of the multiplications of normalized R matrix with the weight vector so that the greatest score is selected as the best alternative (Ai) as a solution.

Table 1 criteria and weight values

Criteria	Description	Score
C1	not the area of geology prone	15
C2	not the area of hydrogeologic prone	15
C3	not the area of topographic prone	10
C4	not the prone area to the flight in airport	10
C5	not the protected area	10
C6	elimination stage	15
C7	determination stage	10
C8	type of waste	15
Total Score		**100**

Source SNI 19-3241-1994

Alternative:
A1: TPS 1
A2: TPS 2
A3: TPS 3
A4: TPS 4
A5: TPS 5
A6: TPS 6

C. Research Framework

The research framework of this research is how to determine temporary landfill in Pagelaran sub-district using simple additive weighting methods. This research method is carried out by identifying a problem, collecting data through observation, interview, and literature research study.

Before designing a decision support system to determine the Temporary Landfill, an analysis was carried out by collecting the required data such as officer data, and location data of the trash. Officer data and location data are used to find out officers who carry out data collection on the trash location. Family card data is used to enter house data to be monitored to be further assessed based on several categories. Criteria data consists of question according to the assessment category consisting of several options or choices. The number of choices from each question is used to determine the weight of each assessment category.

In this case there is a category, namely the facility for temporary landfillwhile the TPS station must be strategic, must exist a ground, and must exist landfill. After that, the multiplier weight of each category is set and the weight calculation of each category is used to determine the total weight of each category and the threshold score of each category, followed by the process of calculating the data collection score for each TPS in each category.

The researcher will compare the results of the study with the threshold. The threshold for determining TPS is more than or equal to 80% of the total results of the data collection score. A TPS can be said fulfill the condition if the total data collection score obtained is greater or equal to (>) the threshold, and a TPS is said to not meet the requirement if the total data collection score obtained is smaller (<) than the threshold. The following is an illustration of how the process in the assessment of TPS determination through (Flow chart).

IV. DISCUSSION

A. Research Result

In this research, weight and criteria in assesment of temporary landfill in Pagelaran Sub District.

Table 2 criteria and weight values

Criteria	Description	Score
C1	not the area of geology prone	15
C2	not the area of hydrogeologic prone	15
C3	not the area of topographic prone	10
C4	not the prone area to the flight in airport	10
C5	not the protected area	10
C6	elimination stage	15
C7	determination stage	10
C8	type of waste	15
	Total Score	**100**

Source : SNI 19-3241-1994

Table 3 weight score

Weight	Score
Very bad	0
Bad	0.2
Poorly good	0.4
Pretty good	0.6
Good	0.8
Very good	1.0

Table 4 Not the area of geology prone C1

Geology area	Weight	Score

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Not erotion/land slide prone area	Very good	1
Not flood prone area	Good	0.8
Not mining area	Pretty good	0.6
Near with HR	Very bad	0

Table 5 Not the area if hydrogeological prone C2

Not water area	Weight	Score
far from water	Very good	1
far from river upstream	Good	0.8
near with gutter	Poorly good	0.4
located on water area	Very bad	0

Table 6 Not the area of topographic prone C3

Settlemen area	Weight	Score
Not settlemen area	Very good	1
far from road	Good	0.8
Near with market	Poorly good	0.4
Located in the center of settlement	Very bad	0

Table 7 Not the prone area to the flight in airport C4

Flight area	Weight	Score
Not in flight area	Very good	1
far from airport	Good	0.8
Near with airport	Poorly good	0.4
located in flight area	Very bad	0

Table 8 Not the protected area C5

Area	Weight	Score
Not protected area	Very good	1
Not the field	Good	0.8
Located near river	Poorly good	0.4

Table 9 elimination stage C6

Elimination stage	Weight	Score
Determine location together	Very good	1
Determine location individually	Good	0.8

Table 10 determination stage C7

Determination stage	Weight	Score
determination stage	Very good	1
Technical stage	Good	0.8

Table 11 Types of Waste C8

Inorganic waste	Weight	Score
Used	Very good	1
Burned	Good	0.8
TPS	Fairly good	0.6

B. Alternative Weighting for Each Criterion

Table 12 Weighting of criteria alternative

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

C. Normalization for Each Criterion

In decision making researcher must give weight according to quality of each needed criterion as follows : **Vector X (15, 15, 10, 10, 10, 15, 10, 15)**

Creating x decision matrix, it can be seen in compatibility table below :

$$X=\begin{Bmatrix} 0.8 & 0.8 & 0.4 & 1 & 0.8 & 1 & 0.8 & 1 \\ 1 & 1 & 0.4 & 0.8 & 1 & 0.8 & 1 & 0.8 \\ 0.6 & 0.4 & 0.8 & 1 & 1 & 0.8 & 1 & 0.8 \\ 0.8 & 1 & 0.8 & 0.4 & 0.4 & 1 & 0.8 & 0.6 \\ 1 & 0.8 & 1 & 1 & 0.8 & 1 & 1 & 1 \\ 0.6 & 0.4 & 1 & 0.8 & 0.4 & 0.8 & 1 & 1 \end{Bmatrix}$$

Firstly, we normalize the X matrix to calculate each alternative based on criteria. Because each weight given to each criterion was a compatibility score, all the criteria given were assumed to be benefit criteria. Calculation of final results by taking a sample of attribute score from 6 samples of TPS in Pagelaran District.

Benefit criteria:

$$R_{ij} = \left(\frac{X_{ij}}{\max\{X_{ij}\}}\right) \qquad (3)$$

A1

$$R_{11} = \left(\frac{0.8}{Max\ \{0.8\ 1\ 0.6\ 0.8\ 1\ 0.6\}}\right) = \frac{0.8}{1} = 0.8$$

$$R_{21} = \left(\frac{0.8}{Max\ \{0.8\ 1\ 0.4\ 1\ 0.8\ 0.4\}}\right) = \frac{0.8}{1} = 0.8$$

$$R_{31} = \left(\frac{0.4}{Max\ \{0.4\ 0.4\ 0.8\ 0.8\ 1\ 1\}}\right) = \frac{0.4}{1} = 0.4$$

$$R_{41} = \left(\frac{1}{Max\ \{1\ 0.8\ 1\ 0.8\ 1\ 0.8\}}\right) = \frac{1}{1} = 1$$

$$R_{51} = \left(\frac{0.8}{Max\ \{0.8\ 1\ 1\ 0.4\ 0.8\ 0.4\}}\right) = \frac{0.8}{1} = 0.8$$

$$R_{61} = \left(\frac{1}{Max\ \{1\ 0.8\ 0.8\ 1\ 1\ 0.8\}}\right) = \frac{1}{1} = 1$$

$$R_{71} = \left(\frac{0.8}{Max\ \{0.8\ 1\ 1\ 0.8\ 1\ 1\}}\right) = \frac{0.8}{1} = 0.8$$

$$R_{81} = \left(\frac{1}{Max\ \{1\ 0.8\ 0.8\ 0.6\ 1\ 1\}}\right) = \frac{1}{1} = 1$$

A2

$$R_{12} = \left(\frac{1}{Max\ \{0.8\ 1\ 0.6\ 0.8\ 1\ 0.6\}}\right) = \frac{1}{1} = 1$$

$$R_{22} = \left(\frac{1}{Max\ \{0.8\ 1\ 0.8\ 1\ 0.8\ 0.4\}}\right) = \frac{1}{1} = 1$$

$$R_{32} = \left(\frac{0.4}{Max\ \{0.4\ 0.4\ 0.8\ 0.8\ 1\ 1\}}\right) = \frac{0.4}{1} = 0.4$$

$$R_{42} = \left(\frac{0.8}{Max\ \{1\ 0.8\ 1\ 0.4\ 1\ 0.8\}}\right) = \frac{0.8}{1} = 0.8$$

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$$R_{52} = \left(\frac{1}{Max\ \{0.8\ 1\ 1\ 0.4\ 0.8\ 0.4\}}\right) = \frac{1}{1} = 1$$

$$R_{62} = \left(\frac{0.8}{Max\ \{1\ 0.8\ 0.8\ 1\ 1\ 0.8\}}\right) = \frac{0.8}{1} = 0.8$$

$$R_{72} = \left(\frac{1}{Max\ \{0.8\ 1\ 1\ 0.8\ 1\ 1\}}\right) = \frac{1}{1} = 1$$

$$R_{82} = \left(\frac{0.8}{Max\ \{1\ 0.8\ 0.8\ 0.6\ 1\ 1\}}\right) = \frac{0.8}{1} = 0.8$$

A3

$$R_{13} = \left(\frac{0.6}{Max\ \{0.8\ 1\ 0.6\ 0.8\ 1\ 0.6\}}\right) = \frac{0.6}{1} = 0.6$$

$$R_{23} = \left(\frac{0.4}{Max\ \{0.8\ 1\ 0.4\ 1\ 0.8\ 0.4\}}\right) = \frac{0.4}{1} = 0.4$$

$$R_{33} = \left(\frac{0.8}{Max\ \{0.4\ 0.4\ 0.8\ 0.8\ 1\ 1\}}\right) = \frac{0.8}{1} = 0.8$$

$$R_{43} = \left(\frac{1}{Max\ \{1\ 0.8\ 1\ 0.4\ 1\ 0.8\}}\right) = \frac{1}{1} = 1$$

$$R_{53} = \left(\frac{1}{Max\ \{0.8\ 1\ 1\ 0.4\ 0.7\ 0.4\}}\right) = \frac{1}{1} = 1$$

$$R_{63} = \left(\frac{0.8}{Max\ \{1\ 0.8\ 0.8\ 1\ 1\ 0.8\}}\right) = \frac{0.8}{1} = 0.8$$

$$R_{73} = \left(\frac{1}{Max\ \{0.8\ 1\ 1\ 0.8\ 1\ 1\}}\right) = \frac{1}{1} = 1$$

$$R_{83} = \left(\frac{0.8}{Max\ \{1\ 0.8\ 0.8\ 0.6\ 1\ 1\}}\right) = \frac{0.8}{1} = 0.8$$

A4

$$R_{14} = \left(\frac{0.8}{Max\ \{0.8\ 1\ 0.6\ 0.8\ 1\ 0.6\}}\right) = \frac{0.8}{1} = 0.8$$

$$R_{24} = \left(\frac{1}{Max\ \{0.8\ 1\ 0.4\ 1\ 0.8\ 0.4\}}\right) = \frac{1}{1} = 1$$

$$R_{34} = \left(\frac{0.8}{Max\ \{0.4\ 0.4\ 0.8\ 0.8\ 1\ 1\}}\right) = \frac{0.8}{1} = 0.8$$

$$R_{44} = \left(\frac{0.4}{Max\ \{1\ 0.8\ 1\ 0.4\ 1\ 0.8\}}\right) = \frac{0.4}{1} = 0.4$$

$$R_{54} = \left(\frac{0.4}{Max\ \{0.8\ 1\ 1\ 0.4\ 0.8\ 0.4\}}\right) = \frac{0.4}{1} = 0.4$$

$$R_{64} = \left(\frac{1}{Max\ \{1\ 0.8\ 0.8\ 1\ 1\ 0.8\}}\right) = \frac{1}{1} = 1$$

$$R_{74} = \left(\frac{0.8}{Max\ \{0.8\ 1\ 1\ 0.8\ 1\ 1\}}\right) = \frac{0.8}{1} = 0.8$$

$$R_{84} = \left(\frac{0.6}{Max\ \{1\ 0.8\ 0.8\ 0.6\ 1\ 1\}}\right) = \frac{0.6}{1} = 0.6$$

A5

$$R_{15} = \left(\frac{1}{Max\ \{0.8\ 1\ 0.6\ 0.8\ 1\ 0.6\}}\right) = \frac{1}{1} = 1$$

$$R_{25} = \left(\frac{0.8}{Max\ \{0.8\ 1\ 0.4\ 1\ 0.8\ 0.4\}}\right) = \frac{0.8}{1} = 0.8$$

$$R_{35} = \left(\frac{1}{Max\{\ 0.4\ 0.4\ 0.7\ 0.7\ 1\ 1\}}\right) = \frac{1}{1} = 1$$

$$R_{45} = \left(\frac{1}{Max\ \{1\ 0.8\ 1\ 0.4\ 1\ 0.8\}}\right) = \frac{1}{1} = 1$$

$$R_{55} = \left(\frac{0.8}{Max\ \{0.8\ 1\ 1\ 0.4\ 0.8\ 0.4\}}\right) = \frac{0.8}{1} = 0.8$$

$$R_{65} = \left(\frac{1}{Max\ \ \{1\ 0.8\ 0.8\ 1\ 1\ 0.8\}}\right) = \frac{1}{1} = 1$$

$$R_{75} = \left(\frac{1}{Max\ \ \{0.8\ 1\ 1\ 0.8\ 1\ 1\}}\right) = \frac{1}{1} = 1$$

$$R_{85} = \left(\frac{1}{Max\ \ \{1\ 0.8\ 0.8\ 0.6\ 1\ 1\}}\right) = \frac{1}{1} = 1$$

A6

$$R_{16} = \left(\frac{0.6}{Max\ \ \{\ 0.8\ 1\ 0.6\ 0.8\ 1\ 0.6\}}\right) = \frac{0.6}{1} = 0.6$$

$$R_{26} = \left(\frac{0.4}{Max\ \ \{0.7\ 1\ 0.4\ 1\ 0.7\ 0.3\}}\right) = \frac{0.4}{1} = 0.4$$

$$R_{36} = \left(\frac{1}{Max\ \ \{0.4\ 0.4\ 0.8\ 0.8\ 1\ 1\}}\right) = \frac{1}{1} = 1$$

$$R_{46} = \left(\frac{0.8}{Max\ \ \{1\ 0.8\ 1\ 0.3\ 1\ 0.7\}}\right) = \frac{0.8}{1} = 0.8$$

$$R_{56} = \left(\frac{0.4}{Max\ \ \{0.8\ 1\ 1\ 0.4\ 0.7\ 0.3\}}\right) = \frac{0.4}{1} = 0.4$$

$$R_{66} = \left(\frac{0.8}{Max\ \ \{1\ 0.8\ 0.8\ 1\ 1\ 0.8\}}\right) = \frac{0.8}{1} = 0.8$$

$$R_{76} = \left(\frac{1}{Max\ \ \{0.8\ 1\ 1\ 0.8\ 1\ 1\}}\right) = \frac{1}{1} = 1$$

1) $R_{86} = \left(\frac{1}{Max\ \{1\ 0.8\ 0.8\ 0.6\ 1\ 1\}}\right) = \frac{1}{1} = 1$

Secondly, create normalization of Y matrix obtained from X result as follows :

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2)

$$\begin{Bmatrix} 0.8 & 1 & 0.6 & 0.8 & 1 & 0.6 \\ 0.8 & 1 & 0.4 & 1 & 0.8 & 0.4 \\ 0.4 & 0.4 & 0.8 & 0.8 & 1 & 1 \\ 1 & 0.7 & 1 & 0.4 & 1 & 0.8 \\ 0.4 & 1 & 1 & 0.4 & 0.8 & 0.4 \\ 1 & 0.8 & 0.8 & 1 & 1 & 0.8 \\ 0.8 & 1 & 1 & 0.8 & 1 & 1 \\ 1 & 0.8 & 0.8 & 0.6 & 1 & 1 \end{Bmatrix}$$

D. Calculation

By multiplying each column in table with declared weight criteria.

Vector weight **:**

C1 = 15
C2 = 15
C3 = 10
C4 = 10
C5 = 10
C6 = 15
C7 = 10
C8 = 15

By the equation :

$$V_i = \sum_{j=1}^{n} w_j \, r_{ij} \quad (4)$$

V_1 = (0.8x15) + (0.8x15) + (0.4x10) + (1x10) + (0.8x10) + (1x15) + (0.8x10) + (1x15) = (12+12+4+10+8+15+8+15) = 84

V_2 = (1x15) + (1x15) + (0.4x10) + (0.8x10) + (1x10) +(0.8x15) + (1x10) + (0.8x15) = (15+15+4+8+10+12+10+12) = 86

V_3 = (0.6x15) + (0.4x15) + (0.8x10) + (1x10) + (1x10) + (0.8x15) + (1x10) + (0.8x15) = (9+6+8+10+10+12+10+12) = 77

V_4 = (0.8x15) + (1x15) + (0.8x10) + (0.4x10) + (0.4x10) + (1x15) + (0.8x10) + (0.6x15) = (12+15+8+4+4+15+8+9)= 75

V_5 = (1x15) + (0.8x15) + (1x10) + (1x10) + (0.8x10) + (1x15) + (1x10) + (1x15) = (15+12+10+10+8+15+10+15) = 95

V_6 = (0.6x15) + (0.4x15) + (1x10) + (0.8x10) + (0.4x10) + (0.8x15) + (1x10) + (1x15) = (9+6+10+8+4+12+10+15) = 74

E. Research Result Analysis

By multiplication of X*Y matrix above otained the results as follow :

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

The score of the sum of the above matrix was V1 = 84 V2 = 86 and V5 = 95, thus the alternative had fulfilled the requirement and can be said to be a temporary landfill because it met the threshold score in the assessment of temporary trash shellter weght was 80% of the total data collection results. Whereas V5 can be called the best quality Trash with the fifth alternative TPS in the Performance Area.

V. CONCLUSION

By using the method of Simple Additive Weighting, it is more effective and efficient to use in determining temporary trash shellter. From the discussion above, the determination of temporary trash shellter still use mathematical calculation methods using Excel, and not yet developed with the application program. It is expected that further research can develop using applications, android, web, or other methods for the perfection of this research.

REFERENCES

1. "Bandar Lampung News Warga Bumi Ayu Tolak TPA Sampah," *www.bandarlampungnews.com/m/index.php?ctn=1&k=politik&i=19529-Warga-Bumiayu-Tolak-TPA-Sampah-*, p. 19529, 2014.
2. Muslihudin, M., Latif, A., Ipnuwati, S., Wati, R., Maseleno, A., A solution to competency test expertise of engineering motorcycles using simple additive weighting approach, Int J. Pure Appl. Math, Vol. 118, No. 7, 2018, pp. 261-267.
3. Mukodimah, S., Mulihudin, M., Andoyo, A., Hartati, S., Maseleno, A., Fuzzy simple additive weighting and its application to toddler healthy food, Int. J. Pure Appl. Math, Vol. 118, No. 7, 2018, pp. 1-7.
4. Muslihudin, M., Susanti, T.S., Maseleno, A., The priority of rural road development using fuzzy logic based simple additive weighting, Int. J. Pure Appl. Math, Vol. 118, No. 8, 2018, pp. 9-16.
5. Irviani, R., Dinulhaq, I., Irawan, D., Renaldo, R., Maseleno, A., Areas prone of the bad nutrition based multi attribute decision making with fuzzy simple additive weighting for optimal analysis, Int. J. Pure Appl. Math, Vol. 118, No. 7, 2018, pp. 589-596.
6. Oktafianto, Akbar, M.R.A., Fitrian, Y., Zulkifli, Sodikin, Wulandari, Maseleno, A., Dismisall working relationship using Analytical Hierarchy Process Method, Int. J. Pure Appl. Math, Vol. 118, No. 7, 2018, pp. 177-183.
7. Susilowati, T., Anggraeni, E.Y., Fauzi, Andewi, W., Handayi, Y., Maseleno, A., Using profile matching method to employess position movement, International Journal of Pure and Applied Mathematics, Vol. 118, No. 7, 2018, pp. 415-422.
8. Sugiyarti, E., Jasmi, K.A., Basiron, B., Huda, M. Shankar, K., Maseleno, A., Decision support system of scholarship grantee selection using data mining, International Journal of Pure and Applied Mathematics, Vol. 119, No. 15, 2018, pp. 2239-2249.
9. Kurniasih, D., Jasmi, K.A., Basiron, B., Huda, M., Maseleno, A., The uses of fuzzy logic method for finding agriculture and livestock value of potential village, International Journal of Engineering & Technology (UAE), Vol. 7, No. 3, 2018, pp. 1091-1095.
10. Adela, H., Jasmi, K.A., Basiron, B., Huda, M., Maseleno, A., Selection of dancer nmember using simple additive weighting, International Journal of Engineering & Technology (UAE), Vol. 7, No. 3, 2018, pp. 1096-1107.
11. Maseleno, A., Tang, A.Y.C., Mahmoud, M.A., Othman, M., Negoro, Y.S., Boukri, S., Shankar, K., Abadi, S. Muslihudin, M., The Application of Decision Support System by using Fuzzy SAW Method in Determining the Feasibility of Electrical Installations in Customer's House, International Journal of Pure and Applied Mathematics, Vol. 119, No. 16, 2018, pp. 4277-4286.
12. Anggraeni, E.Y., Huda, M., Maseleno, A., Safar, J., Jasmi, K.A., Mohamed, A.K., Hehsan, A., Basiron, B., Ihwani, S.S., Embong, W.H.W., Mohamad, A.M., Noor, S.S.M., Fauzi, A.N., Wijaya, D.A., Poverty Level Grouping using SAW Method, International Journal of Engineering and Technology (UAE), Vol. 7, No. 2.27, 2018, pp. 218-224.
13. Abadi, S., Huda, M., Jasmi, K.A., Noor, S.S.M., Safar, J., Mohamed, A.K., Embong, W.H.W., Mohamad, A.M., Hehsan, A., Basiron, B., Ihwani, S.S., Maseleno, A., Muslihudin, M., Satria, F., Irawan, D., Hartati, S., Determination of the Best

Quail Eggs using Simple Additive Weighting, International Journal of Engineering and Technology (UAE), Vol. 7, No. 2.27, 2018, pp. 225-230.
14. A. Fachrial, Z. Arifin, and D. M. Khairina, "Pembuangan Akhir Sampah Kota Samarinda Metode Simple Aditive Weighting Berbasis Desktop," *kmsi*, vol. 2, no. 1, p. 4, 2017.
15. N. K. Ariasih, I. P. A. Bayupati, and I. K. G. D. Putra, "Sistem Pendukung Keputusan Pemilihan Lokasi Tpasampah Menggunakan Metode Min_Max Inference Fuzzy," *J. Teknol. Elektro*, vol. Volume 14, no. No. 1, pp. 7–10, 2015.
16. Ristiani, Pardimin, Teh, K.S.M., Fauzi, A., Hananto, A.L., Huda, M., Muslihudin, M., Shankar, K., Maseleno, A., Decision Support System Model for Selection of Best Formula Milk for toddlers using Fuzzy Multiple Attribute Decision Making, Journal of Advanced Research in Dynamical and Control Systems, Vol. 10, 02-Special Issue, 2018.
17. Hamid, A., Sudrajat, A., Kawangit, R.M., Don, A.G., Huda, M., Jalal, B., Akbar, W., Onn, A., Maseleno, A., Determining basic food quality using SAW, International Journal of Engineering and Technology(UAE), Vol. 7, No. 4, pp. 3548-3555, 2018.
18. Oktafianto, Kawangit, A.S., Kawangit, R.M., Don, A.G., Huda, M., Saputri, A.D., Latif, A.A., Maseleno, A., Determining housing location using weighted product, International Journal of Engineering and Technology(UAE), Vol. 7, No. 4, pp. 3563-3568, 2018.
19. Fauzi, Huda, M., Teh, K.S.M., Haron, Z., Ripin, M.N., Hehsan, A., Abas, H., Rafiq, M., Irawan, J., Abadi, S., Maseleno, A., The Design of Fuzzy Expert System Implementation for Analyzing Transmissible Disease of Human, International Journal of Pharmaceutical Research, Vol. 10, Issue 4, 2018.
20. Abadi, S., Huda, M., Teh, K.S.M., Haron, Z., Ripin, M.N., Hehsan, A., Sarip, S., Hehsan, M.R., Amrullah, M., Maseleno, A., Hazard Level of Vehicle Smoke by Fuzzy Multiple Attribute Decision Making with Simple Additive Weighting Method, International Journal of Pharmaceutical Research, Vol. 10, Issue 4, 2018.
21. Aminudin, N., Huda, M., Kilani, A., Embong, W.H.W., Mohamed, A.M., Basiron, B., Ihwani, S.S., Noor, S.S.M., Jasmi, K.A., Higher education selection using simple additive weighting, International Journal of Engineering and Technology (UAE), Vol. 7, No. 2.27, 2018, pp. 211-217.
22. E. Turban, R. Sharda, and D. Delen, *Decision Support and Business Intelligence Systems. Chapter 6 Artificial Neural Networks for Data Mining*, vol. 8th. 2007.
23. E. Turban, J. E. Aronson, and T.-P. Liang, "Decision Support Systems and Intelligent Systems," *Decis. Support Syst. Intell. Syst.*, vol. 7, p. 867, 2007.
24. M. H. Aghdaie, S. H. Zolfani, and E. K. Zavadskas, "Synergies of Data Mining and Multiple Attribute Decision Making," in *Procedia - Social and Behavioral Sciences*, 2014, vol. 110, pp. 767–776.
25. S. Khademolqorani and A. Z. Hamadani, "An Adjusted Decision Support System through Data Mining and Multiple Criteria Decision Making," in *Procedia - Social and Behavioral Sciences*, 2013, vol. 73, pp. 388–395.
26. T. E. Erkan and B. D. Rouyendegh, "Curriculum Change Parameters Determined by Multi Criteria Decision Making (MCDM)," *Procedia - Soc. Behav. Sci.*, vol. 116, no. 1987, pp. 1744–1747, 2014.
27. S. Kusumadewi, S. Hartati, A. Harjoko, and Retanto Wardoyo, *Fuzzy Multi-Attribute Decision Making (Fuzzy MADM)*. Yogyakarta: Graha Ilmu, 2013.
28. D. Anggraini, M. B. Pertiwi, and D. Bahrin, "Pengaruh Jenis Sampah, Komposisi Masukan Dan Waktu Tinggal Terhadap Komposisi Biogas Dari Sampah Organik," vol. 18, no. 1, pp. 17–23, 2012.
29. "Jenis-Jenis Sampah Gelbert (1996)." 2015.
30. 03-3241-1994 SNI, "Pengertian TPA," vol. 2454, pp. 10–41, 2009.
31. S. Y. Chou, Y. H. Chang, and C. Y. Shen, "A fuzzy simple additive weighting system under group decision-making for facility location selection with objective/subjective attributes," *Eur. J. Oper. Res.*, pp. 132–145, 2008.
32. A. Alinezhad, A. Amini, and A. Alinezhad, "Sensitivity analysis of simple additive weighting method (SAW): the results of change in the weight of one attribute on the final ranking of alternatives," *J. Ind. Eng.*, 2009.