

# Application of simple additive weighting in the decision support system for determining the best location of temporary waste storage places

Ismindari<sup>a,1,\*</sup>, Deny Wiria Nugraha<sup>b,2</sup>, Yuri Yudhaswana Joeфриe<sup>b,3</sup>, Andipa Batara Putra<sup>b,4</sup>, Widya Wisanty<sup>c,5</sup>

<sup>a</sup> Politeknik Bosowa, Jl. Kapasa Raya No. 23, Makassar, South Sulawesi 90245, Indonesia

<sup>b</sup> Tadulako University, Jl. Soekarno Hatta Km. 9, Palu, Central Sulawesi 94119, Indonesia

<sup>c</sup> Universitas Sawerigading, Jl. Kanda No. 127, Makassar, South Sulawesi 90213, Indonesia

<sup>1</sup> ismindarti@politeknikbosowa.ac.id\*; <sup>2</sup> deny.wiria.nugraha@untad.ac.id; <sup>3</sup> yuri.yudhaswana@untad.ac.id; <sup>4</sup> andipabp@gmail.com; <sup>5</sup> wwisanty@gmail.com

\* corresponding author

## ARTICLE INFO

### Article history

Received 29 Jul 2023

Revised 08 Sep 2023

Accepted 12 Des 2023

### Keywords

Simple Additive Weighting

Decision Support System

Rubbish

Temporary Shelter

## ABSTRACT

Waste is a material that is discarded or discarded as a result of human or natural activities. The increase in waste is proportional to the level of human use of goods used in everyday life. Until now, the waste problem has always been a complaint for all people in cities and villages. One effective way to deal with the waste problem is to select the ideal location for a Temporary Waste Storage Site (TPS). This research aims to build a system that can determine the best location for waste TPS using a Decision Support System (DSS) method of Simple Additive Weighting (SAW). In this study, seven assessment criteria were used with 148 test data. The tests showed that the computing time required to get the ranking was 12,528 seconds, and memory usage was 226,2422 kb. Also, this system produces an accuracy level of 93.24%, which shows that it can function well using the SAW method and has a pretty good level of accuracy.

This is an open access article under the [CC-BY-SA](#) license.



## 1. Introduction

Currently, the environment around the house cannot be separated from what is called rubbish, which is a material discarded or discarded due to human or natural activities. The increase in waste is proportional to the level of human use of goods used in daily life. One effective way to deal with the waste problem is to select the ideal location for a TPS. The role of waste TPS is vital for the community and the government in maintaining environmental cleanliness. In the Palu City area, there are still several problems related to waste TPS, including the number of waste TPS, which is still minimal, and there are complaints from the public about the placement of waste TPS in inappropriate locations and which are considered to disturb the comfort of several local communities. This is why many people throw rubbish carelessly, resulting in large piles of rubbish in an area. Based on the description above, the formulation of this research problem is how to design and build a decision support system to determine the best location for waste landfills using the SAW method. Meanwhile, this research aims to build a decision support system that can assist in making decisions efficiently to determine the best location for waste TPS using the SAW method, and the output of the system built is visualization mapping where the map will display the location of waste TPS, making it easier for the public. Know the location of the waste landfill.

There have been several previous studies related to decision support systems in determining the best location for waste landfills and the SAW method, a researcher A researcher developed two

multi-criteria decision-making approaches involving subjective and objective criteria for warehouse location selection. The Brown and Gibson approach estimates the warehouse location selection index by combining subjective factor measurement (SFM) and objective factor measurement (OFM). This study finds that the proposed methodology is effective as a multi-criteria decision-making (MCDM) tool for evaluating and selecting warehouse locations in the supply chain [1]. Another researcher conducted the Decision Support System for Determining the Best Location for Temporary Waste Disposal Sites Using the Brown-Gibson Method. The results of this research produce an output ranking of priority values for alternative locations so that each alternative with the highest value has a greater chance of being the best location for making a temporary waste dump using the Brown-Gibson method and using visualization mapping as the output of the system created [2].

The researcher conducted the Decision Support System for Determining Final Disposal Locations for Samarinda City Waste, Desktop-Based Simple Additive Weighting Method. The results of this research build a desktop-based system by utilizing SPK to help people make decisions quickly, precisely, and consistently in determining the location of final waste disposal sites (TPA) using the SAW method [3]. Another research was conducted by regarding Decision Support Systems for Selecting Residential Housing in Housing Using the SAW method (Case Study: Samarinda City). The results of this research produce a system for selecting a residence in the desired housing complex from various existing housing options based on predetermined criteria using the SAW method so that the assessment process is better and can provide the best alternative in determining housing [4].

The researcher conducted about the Decision Support System for Bidik Misi Scholarship Acceptance at POLIBAN Using the Web-Based SAW Method. The results of this research are the system that was built, the final results obtained from the calculation process using the SAW method with predetermined weights for each criterion, where the results of the ranking of Bidik Misi scholarship recipients who are closest to the criteria to those who are furthest from the criteria, from these results, an alternative is obtained. Who then received a Bidik Misi scholarship [5]. Research conducted by [6] regarding implementing the SAW Method in Decision Support Systems in Determining Road Repair Priorities. The result of this research is to build a system to assist in determining road repair priorities in the Kabu Raya Regency area by implementing the SAW method using predetermined criteria:

1. Research conducted by regarding Decision Support Systems for Determining Chili Planting Land Using the Simple Additive Weighting Method. The results of the research are a constructive decision support system for determining chilli planting land using the SAW method so that it can help chilli farmers in supporting decisions to determine chilli planting land, where the results are in the form of the highest recommended ranking value [7].
2. Research conducted about decision Support System Mapping Quality Agricultural Land to Increase Rice Production Using the SAW method. The results of this research utilize a decision support system to assist in determining the suitability of agricultural areas using the SAW method by the assessment criteria for an area, namely soil type, rainfall, waters, temperature and soil texture [8].
3. Research was conducted by regarding applying the SAW method in the decision support system for location selection for new branches of UD Food Stores. Indo Multi Fish. The results of this research build a system for finding the best locations for building new branches of UD stores. Indo Multi Fish uses the SAW method. In looking for the best location for a new branch, six criteria are used, namely the price of land for the location, distance to the old shop, distance to the storage warehouse, level of competition with other shops, investment value in the next three years, and the level of community that keeps fish [9].
4. Research was conducted regarding the decision support system for selecting boarding houses for students in Luwuk Banggai using the SAW method. The results of this research are implementing a decision support system in selecting a boarding house using the SAW method. This selection of boarding houses can help students choose the right boarding house and speed up their process of determining the results of choosing a boarding house [10][11].
5. Research conducted by [12] regarding the Decision Support System for Determining Priorities for the Distribution of Clean Water in Water Crisis Areas in the Bondowoso Regency Area Using the SAW method. This research results in creating a decision support system that can help determine priorities for distributing clean water using the SAW method.

6. Research conducted by regarding the Decision Support System for Determining the Best State Civil Apparatus at the Water Resources Management Service, Technical Implementation Unit of the Service using the Simple Additive Weighting Method. The results of this research utilize SPK to assist in conducting performance assessments and see the best employee performance using the SAW method in the selection process to assist the decision-making process using seven criteria, namely loyalty, work performance, responsibility, obedience, honesty, cooperation, and initiative [13].

Based on the objectives of the literature that have been described, this research is more focused on creating a decision support system for determining the best waste landfill location using the SAW method. The results of this research can help make decisions efficiently to determine the best waste TPS location using predetermined criteria.

### **1.1 . Decision Support System (DSS)**

A system is a collection of objects such as people, resources, concepts, and procedures intended to perform certain functions or fulfill a goal. The word decision means choice, namely the choice of two or more possibilities. Decisions can also mean choosing a strategy or action to solve a problem. Decision-making is the act of choosing a strategy or action that the manager believes will provide the best solution to something. SPK is a system that aims to support managers in making decisions in semi-structured problem conditions. SPK functions as a facility that can strengthen decision-makers' capabilities but only partially replaces the role of decision-makers [14], [15].

### **1.2. Simple Additive Weighting (SAW)**

The SAW method is often also known as the weighted addition method. The basic concept of the SAW method is to find the weighted sum of the performance ratings for each alternative on all attributes. The SAW method is the most well-known and commonly used method for Multiple Attribute Decision Making (MADM) [16].

This SAW method requires decision-makers to determine the weight for each attribute. The total score for an alternative is obtained by adding up all the results by multiplying the ratings (which can be compared across attributes) and the weight of each attribute. The rating for each attribute must be dimension-free because it has gone through a previous matrix normalization process [16].

According to [16] The steps of the SAW method are:

1. Determine the criteria used as a reference in decision-making, namely C,
2. Determine the suitability rating matrix for each alternative for each criterion
3. Create a decision matrix based on criteria (C), then normalize the matrix based on equations adjusted to the type of attribute (profit attribute or cost attribute) to obtain a normalized matrix R.
4. The final result is obtained from the ranking process, namely the sum of the multiplications of the normalized matrix R with the weight vector to obtain the most significant value, which is selected as the best alternative (A) as a solution [17]–[20].

### **1.1 Temporary Waste Storage Site (TPS)**

According to the Law of the Republic of Indonesia, Number 18 of 2008 concerning Waste Management, a Temporary Storage Place is a place before waste is transported to a recycling, processing and integrated waste processing site [21].

### **4.2. Rubbish**

According to Law of the Republic of Indonesia Number 18 of 2008 concerning Waste Management, waste is the remains of daily human activities and natural processes in solid form. Waste can also come from animal and natural activities [21].

## **2. Method**

This research uses qualitative research. Qualitative research seeks to understand and interpret the meaning of an event involving human behavior in certain situations according to the researcher's perspective. The researcher herself is the data collection tool or research instrument in qualitative methods.

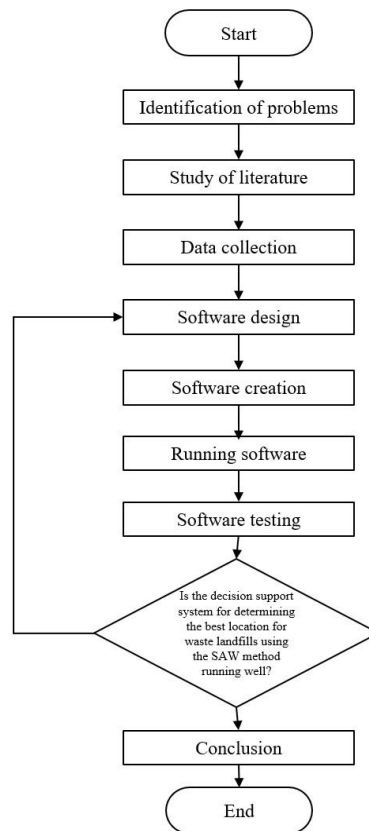
## 1.2. Data collection technique

Data collection techniques in this research include:

2. Observation, The observations made in this research were by looking for existing problems and solutions to solve them and observing what data would be needed to build a decision support system for determining the best location for waste landfills,
3. Interview, Interviews are a data collection technique for orally obtaining data and information from research objects. The interview referred to in this research involves interviewing parties from the Palu City Environmental Service to obtain information on determining the location of waste landfills in the Palu City area using question and answer or dialogue.
4. Study of Literature, The literature study in this research was carried out by collecting library materials by reading, studying and recording essential things related to the research being carried out in order to obtain a theoretical picture. The intended reading sources are books, journals, and articles on the internet.

## 1.3. Research Stages

The stages carried out in this research are shown in Figure 1 below.



**Fig. 1.** Research stages

The following is an explanation of each stage of the research method carried out:

1. Identification of problems, At this stage, identify the problem to be solved and determine the solution. Finding the subject to be discussed, defining the problem, and figuring out the goals and advantages of the study are all done first by identifying the problem.
2. Study of Literature, Literature studies are carried out to solve problems by tracing written sources that have been written before. The literature study aims to find theoretical references relevant to the SAW method sourced from written texts, both printed and online.
3. Data collection, Data collection is carried out to collect the data needed for research. In this research, the data collected is primary and secondary data. Preliminary data in this research is obtained directly from the first party by conducting observations and interviews with the Palu



















