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Optimizing Tourist Destination Selection in Aceh Besar through MOORA-Based Decision Support System

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Abstract

This research is motivated by the abundant tourism potential in Kabupaten Aceh Besar, which has not been adequately supported by a recommendation system capable of providing measurable and integrated information on travel costs, distance, travel time, supporting facilities, and cleanliness levels at each destination. consequently, tourist often face difficulties in selecting destinations that best match their preferences and constraint. To solve this problems, a web-based Decision Support System (DSS) is developed to assist tourists in obtaining objective and efficient tourism recommendations. This study aims to determine the best tourism destinations by applying the Multi-Objective Optimization in the Basis of Ratio Analysis (MOORA) method within the proposed DSS framework. The MOORA method is selected for its simplicity, stability, and ability to process both benefit and cost type criteria simultaneously. The calculation procedure includes three key stages: normalization of the decision matrix, assignment of weights to each criterion, and ranking determination based on the optimization values that help identify the most suitable tourism destinations for the tourists. The results indicate that the top three recommended destinations are Eky Momong Resort (A6) as the first rank with a score Yi=0.0676, Air Terjun Elnaja (A9) as the second rank with a score Yi=0.0619, and Pucok Krueng (A10) as the third rank with a score of Yi=0.0350. This findings confirm that the MOORA method is effective in producing objective and consistent. With the development of this web-based system, the tourist are able to obtain recommendations that are more objective, efficient, and aligned with relevan criteria.

Keywords: Decision Support System, MOORA Method, Tourist Recommendation, Multi-Criteria Decision Making (MCDM), Web-Based Application, Aceh Besar.

1. Introduction

Aceh Besar is one of the districts located in the province of Aceh with extraordinary natural tourism potential, including white sandy beaches, dense forests, and magnificent mountains. This natural beauty has attracted the attention of tourists, especially with the help of social media, which indirectly expands tourism promotion. However, this potential has not been fully utilized [1].

One of the main problems often faced by tourists is the lack of information about tourist locations, such as road access, public facilities, and travel distances. This situation causes inefficiency in planning trips, both in terms of time and cost. Therefore, it is very important to have a system that can suggest more accurate and informative destinations.

In this research, we proposed the use of the *Multi-Objective Optimization on the basis of Radio Analysis* (MOORA) method as a decision support system to assist tourists in choosing the best destinations in Aceh Besar. This method allows for a comprehensive assessment by considering various criteria in accordance with the principles of the seven charms [2].

It is a big hope that the results of this study can contribute theoretically to the development of decision support systems and provide practical benefits for tourism sector managers and local government. With more appropriate recommendations, tourism development strategies can be more sustainable and have a positive impact on the local economy and environmental protection.

To support this research, a literature study was conducted with the aim of gaining a better understanding of the theories relevant to the discussion topic. This research focusses on discussing the best tourist recommendations in Aceh Besar. The author took several references to previous research entitled Implementation of the MOORA Method in a Decision Support System for Mountain Climbing Tourist Destination Recommendations in Greater Bandung, taking into account several criteria such as cost, distance, and time, which are very suitable for

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illustrating a real-world example of MOORA application in local tourism [3].

A tourist attraction is a destination designed to offer visitors meaningful experiences anda satisfaction through travel activities aimed at specific objectives within a defined period. The quality of such attractions is shaped not only by their primary appeal but also by the supporting facilities, services, marketing effort, and accessibility [4].

Decision Support System (DSS) are an approach developed to assist in solving problems accurately and efficiently [5]. As an analytical tool, a DSS can process various alternatives based on multiple criteria, producing a ranking that indicates the highest to lowest values using measurable calculations [6]. It supports the evaluation process in addressing both structured and unstructured problems through systematic analysis [7]. Decision support system has various characteristics that make them suitable for application in various business environment. These systems are basically designed to manage semi-structured decision-making processes synchronously [8]. Accordingly, a Decision Support System (DSS) serves not merely as a supporting instrument but also as a mechanism that facilitate the selection of the most appropriate alternative in alignment with stakeholders need. From the various definition outlined, it may be inferred that a DSS is inherently designed to evaluate and determine the optimal alternative by systematically considering multiple relevant criteria.

The primary challenge encountered is ensuring the provision of accurate and relevant information to tourists in selecting the most suitable destinations in Aceh Besar. Although the region processes considerable natural tourism potential, limitations frequently arise conserving information on location, facilities, accessibility, and distance. Such deficiencies contribute to inefficiencies in travel planning, particularly with respect to time and cost.

The data collection methods employed in this study consist of literature review and observation. The literature review provides adequate information [9], while observation was carried out by collecting data through direct field visits to the target locations. The recommendations of the Best Tourism Destinations in Aceh Besar using the MOORA method within a Decision Support System is intended to assist tourists in determining their most suitable travel destinations.

The MOORA (*Multi-Objective Optimization on the basis of Ratio Analysis*) method was introduced by Brausers and Zavadkas and was first applied in multi-criteria decision making by Brausers. This method is highly flexible and allows for the clear separation of subjective elements from the evaluation process into decision weight criteria with various decision-making attributes [10]. MOORA evaluates problems by assigning weights to decision criteria involving various attributes. The strength of this method lies in its ability to simultaneously consider criteria with positive (benefit) or negative (cost) values. Moreover, calculation process is relatively simple while still producing accurate and stable results [11]. In general, the MOORA method consists of a ratio system and the reference point approach. The ratio system aims to evaluate overall performance of each alternative by calculating the differences between the total normalized values and each criterion feature, while the reference point approach fully supports the selection of alternatives [12]. The MOORA method demonstrate strong selection capabilities, as it can choose alternative objects and attributes based on their level of benefit and cost. The data used in MOORA must be non-zero and non-negative, and the method requires relatively simple mathematical calculations [13]. Therefore, the author suggests that the MOORA method can be effectively employed ti address optimization problems, as well as to evaluate and select decisions involving multiple factors.

The MOORA method was selected in this study due to its advantages in the simplicity of the calculation process, which facilities researchers and decision-makers in analyzing various alternative options. The results of MOORA calculation are stable, as the normalization process applied to the initial data ensures objective in the outcomes.

Compared to other methods such as WASPAS (*Weighted Aggregated Sum Product Assessment*), the distinction lies in its evaluation technique. WASPAS combines two approaches simultaneously, namely the Weighted Sum Model (WSM) and the Weighted Product Model (WPM), which makes the results more accurate but slightly more complex then MOORA in terms of computation, as it requires the appropriate selection of a combination coefficient to achieve optimal outcomes [14] [15].

Meanwhile the MAUT (*Multi-Attribute Utility Theory*) method represents a final evaluation scheme, in which an object is described as the weighted sum of its dimensional values, known as utility values [16]. MAUT can be used to transform preferences into a 0-1 scale, where 0 represents the least favorable option and 1 the most favorable. Although MAUT is effective in handling subjective preferences, the process determining utility values for each criterion can be challenging and often requires substantial data and experience [17].

The SMART (*Simple Multi-Attribute Rating Technique*) method applies direct scoring and weighting, making it very simple and fast, however, it relies heavily on subjective judgments. As a result, SMART outcomes tend to be less objective and more prone to bias, since qualitative data are converted into numerical form in a relatively simple manner [18]. In a study conducted by [19], the application of SMART with *Rank Order Centroid* (ROC) weighting improved the objectivity of the analysis. Nevertheless, all criteria were categorized as *benefits*, without incorporating *cost*-type attributes such as travel distance, which in the context of tourism destinations could also serve as an important evaluation criterion.

The Weighted Product (WP) method applies the multiplication of criterion values that have been assigned weights. WP is generally more stable against values changes, however, it is sensitive to data scale and less suitable for the context of this study, particularly in tourism destination evaluation where criteria may very between *cost* and *benefit* types [20].

Among the various methods reviewed, MOORA offers a distinctive balance between computational simplicity and result objectivity. By normalizing all criteria in advance, it enables equitable comparisons across heterogeneous. Furthermore, MOORA accommodate both *benefit* and *cost* criteria within a unified model without requiring additional transformations. In the context of this study, the evaluation of tourism destinations in Aceh Besar encompasses multiple factors, including facilities, cost, distance, time, cleanliness, safety, and accessibility. Owing to its relatively straightforward calculations and the stability of its outcomes, MOORA provides recommendations that are not only objective but also methodologically robust and accountable.

2. Methods (10 PT)

2.1 Research System Flow

To facilitate the research process, the author developed a decision support system research flowchart to simplify each stage of the process. The author determined the scope of the research so as not to deviate from the research objectives, which are :

1. Determine the input for the system in the form of alternative tourist destinations in Aceh Besar and the criteria for each alternative.
2. The data used to determine the criteria and alternatives in this study were obtained from data collected at each tourist destination in Aceh Besar that the author had determined.
3. The criteria used are:
   (1) Travel Cost,
   (2) Distance,
   (3) Travel time,
   (4) Facility, and
   (5) Cleanliness.
   Meanwhile, alternative tourism destination in Aceh Besar are:

   (1) Lhok Mata Ie,
   (2) Bukti Suharto,
   (3) Pasir Putih,
   (4) Lampuuk,
   (5) Kuta Malaka,
   (6) Eky Momong Resort,
   (7) Taman Rusa,
   (8) Lhok Gaca,
   (9) Air Terjun Elnaja, dan
   (10) Pucok Krueng.
4. The expected output is ap prioritized ranking of tourism destinations in Aceh Besar, derived from the computational results using the MOORA method.

The general flow of the system used in this study in figure 1 below:

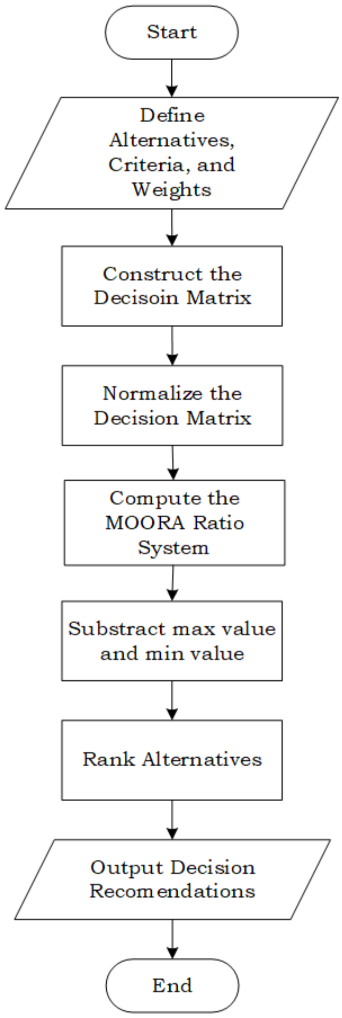


Figure 1. Flow of MOORA Method

2.2 MOORA Method

To complete the calculation using MOORA method, several calculation steps are carried out as follows [21] [22] :

1. Enter criteria
2. Create a decision matrix
3. Perform normalization on the MOORA method. The normalization process is carried out to standardize the scale of each element in the matrix, thereby enabling for comparison between data. In the MOORA method, normalization is calculated using the following equation:

$$R_{ij} = X_{ij} / \sqrt{(\sum_{i=1}^{m} X^2 ij)} \quad (1)$$

where:
R_{ij} : Normalized value of alternative i on criterion j
X_{ij} : Value of alternative i on criterion j
i : Index for criteria
j : Index for alternatives
X*ij : Normalized matrix of alternative i on criterion j

4. Doing weighted normalization. This process is carried out to obtain the relative importance value of each criterion for decision-making. The weighted normalization process using the MOORA method uses the following equation:

$$R_{ij} = W_{ij} * X_{ij} \quad (2)$$

where:
r_{ij} : Weighted normalization of alternative i criterion j
W_{ij} : Weight of criterion j alternative i
X_{ij} : Matrix of alternative i criterion j

5. Calculating preferences values. This process is carried out to obtain the difference between the total value of the benefit criteria (the higher the value, the better) and the total value of the cost criteria (the lower the value, the better) for each alternative. The following equation is used to calculate preferences values:

$$Y_i = \sum_{j=1}^{g} W_j X_{ij} - \sum_{j=g+1}^{n} W_j X_{ij} \quad (3)$$

where:
Y_i : preferences value of alternative i.
j : 1, 2, 3, … , g are attributes or criteria with maximum status.
j=g+1 : g+1, g+2, g+3, … , n are attributes or criteria with minimum status.
W_{ij} : Weight of criterion j for alternative i
X_{ij} : Matrix alternative i for criterion j

6. Alternative ranking recommended based on calculations using the MOORA method.

3. Results and Discussions (10 PT)

The process of obtaining valid data met the research requirements for formulating the best tourism destination recommendations in Aceh Besar. The author utilized the MOORA method calculation, which was conducted through direct observation. It was divided into several stages as follows:

1. Determine Alternative
At the beginning of this process is to determine the alternatives that will be calculated using this MOODA method to obtain recommendations for tourist attractions in Aceh Besar that will become destinations to visit. The alternative tourist attractions in Aceh Besar can be seen in table 1 below.

Table 1. Alternatives of Destination Tourism

No	Alternative (Ai)	Destination Name
1	A1	Lhok Mata Ie
2	A2	Bukit Suhato
3	A3	Pasir Putih
4	A4	Lampuuk
5	A5	Kuta Malaka
6	A6	Eky Momong Resort
7	A7	Taman Rusa
8	A8	Lhok Gaca
9	A9	Air Terjun Elnaja
10	A10	Pucok Krueng

2. Determine Criteria
Next, the decision criteria and their respective weights are determined. These criteria will be evaluated using the MOORA method across all available alternatives, resulting in a final score that serves as a recommendation for decision-making. The criteria and their assigned weights are presented in Table 2.

Table 2. Criteria and Weight Value

Code	Criteria	Weight	Benefit/Cost
C1	Travel Cost	20	Cost
C2	Distance	20	Cost
C3	Travel Time	10	Cost
C4	Facility	30	Benefit
C5	Cleanliness	20	Benefit

3. Determine Values
The next step is to determine the numerical value for the established criteria. This value will determine the weight of the criteria later with the predetermined value. The values used can be seen in Table 3 below.

Table 3. Weight of Criteria Scale

Criteria	Scale
Veri Good	5
Good	4
Enough	3
Bad	2
Very Bad	1

4. Determine the Matrix Values
   The next step is to determine the matrix values, which are entered based on the data that has been analyzed. These matrix values will later be calculated using the MOORA method to obtain recommendations for tourist attractions in Aceh Besar that will become destinations to visit. These matrix values can be seen in Table 4 below.

Table 4. Matrix Value

No	Alternative	Criteria				
		C1	C2	C3	C4	C5
1	A1	4	3	3	3	4
2	A2	5	3	3	3	3
3	A3	5	3	3	3	5
4	A4	5	4	4	4	4
5	A5	4	5	5	5	4
6	A6	3	3	3	5	5
7	A7	4	5	5	5	4
8	A8	3	3	3	2	3
9	A9	3	2	2	5	3
10	A10	3	3	3	5	3

5. Calculate the criteria values.
   To calculate the criteria values, which will be arranged in a normalization matrix, use the following equation 1 :

$$R_{ij} = X_{ij} / \sqrt{(\sum_{i=1}^{m} X^2 ij)}$$

$C1 = \sqrt{4^2+5^2+5^2+5^2+4^2+3^2+4^2+3^2+3^2+3^2}$
$C1 = \sqrt{153} = 12.6095$

$X_{11} = 4/12.6095 = 0.3172$
$X_{12} = 5/12.6095 = 0.3965$
$X_{13} = 5/12.6095 = 0.3965$
$X_{14} = 5/12.6095 = 0.3965$
$X_{15} = 4/12.6095 = 0.3172$
...
$X_{110} = 3/12.6095 = 0.2379$

$C2 = \sqrt{3^2+3^2+3^2+4^2+5^2+3^2+5^2+3^2+2^2+3^2}$
$C2 = \sqrt{124} = 11.1355$
$X_{21} = 3/11.1355 = 0.2694$
$X_{22} = 3/11.1355 = 0.2694$
$X_{23} = 3/11.1355 = 0.2694$
$X_{24} = 4/11.1355 = 0.3592$
$X_{25} = 5/11.1355 = 0.4490$
...
$X_{210} = 3/12.6095 = 0.2694$

$C3 = \sqrt{3^2+3^2+3^2+4^2+5^2+3^2+5^2+3^2+2^2+3^2}$
$C3 = \sqrt{124} = 11.1355$
$X_{31} = 3/11.1355 = 0.2694$
$X_{32} = 3/11.1355 = 0.2694$
$X_{33} = 3/11.1355 = 0.2694$
$X_{34} = 4/11.1355 = 0.3592$
$X_{35} = 5/11.1355 = 0.4490$
...
$X_{310} = 3/12.6095 = 0.2694$

$C4 = \sqrt{3^2+3^2+3^2+4^2+5^2+5^2+5^2+2^2+5^2+5^2}$
$C4 = \sqrt{172} = 13.1148$
$X_{41} = 3/13.1148 = 0.2287$
$X_{42} = 3/13.1148 = 0.2287$
$X_{43} = 3/13.1148 = 0.2287$
$X_{44} = 4/13.1148 = 0.3049$
$X_{45} = 5/13.1148 = 0.3812$
...
$X_{410} = 5/13.1148 = 0.3812$

$C5 = \sqrt{4^2+3^2+5^2+4^2+4^2+5^2+4^2+3^2+3^2+3^2}$
$C5 = \sqrt{150} = 12.2474$
$X_{51} = 4/12.2474 = 0.3265$
$X_{52} = 3/12.2474 = 0.2449$
$X_{53} = 5/12.2474 = 0.4082$
$X_{54} = 4/12.2474 = 0.3265$
$X_{55} = 4/12.2474 = 0.3265$
...
$X_{510} = 3/12.2474 = 0.2449$

The results of calculating the criteria values are arranged in the form of a normalization matrix table for each alternative for each criterion, as shown in Table 5 below:

Table 5. Normalized Matrix Value

No	**Altern ative**	**Criteria**				
		C1	**C2**	**C3**	**C4**	**C5**
1	A1	0.3172	0.2694	0.2694	0.2287	0.3265
2	A2	0.3965	0.2694	0.2694	0.2287	0.2449
3	A3	0.3965	0.2694	0.2694	0.2287	0.4082
4	A4	0.3965	0.3592	0.3592	0.3049	0.3265
5	A5	0.3172	0.4490	0.4490	0.3812	0.3265
6	A6	0.2379	0.2694	0.2694	0.3812	0.4082
7	A7	0.3172	0.4490	0.4490	0.3812	0.3265
8	A8	0.2379	0.2694	0.2694	0.1524	0.2449
9	A9	0.2379	0.1796	0.1796	0.3812	0.2449
10	A10	0.2379	0.2694	0.2694	0.3812	0.2449

6. Calculating weighted normalization
   The next step is the weighted normalization value, which is calculated by calculating weight value the normalization matrix value from table V, using the following equation 2:

$$R_{ij} = W_{ij} * X_{ij}$$

C1

$X_{11} = 0.2x0.3172 = 0.0634$
$X_{12} = 0.2x0.3965 = 0.0793$
$X_{13} = 0.2x0.3965 = 0.0793$
$X_{14} = 0.2x0.3965 = 0.0793$
$X_{15} = 0.2x0.3172 = 0.0634$
...
$X_{110} = 0.2x0.2379 = 0.0475$

C2

$X_{21} = 0.2x0.2694 = 0.0538$
$X_{22} = 0.2x0.2694 = 0.0538$
$X_{23} = 0.2x0.2694 = 0.0538$
$X_{24} = 0.2x0.3592 = 0.0718$
$X_{25} = 0.2x0.4490 = 0.0898$
...
$X_{210} = 0.2x0.2694 = 0.0538$

C3

$X_{31} = 0.1x0.2694 = 0.0269$
$X_{32} = 0.1x0.2694 = 0.0269$
$X_{33} = 0.1x0.2694 = 0.0269$
$X_{34} = 0.1x0.3592 = 0.0359$
$X_{35} = 0.1x0.4490 = 0.0449$
...
$X_{310} = 0.1x0.2694 = 0.0269$

C4

$X_{41} = 0.3x0.2287 = 0.0686$
$X_{42} = 0.3x0.2287 = 0.0686$
$X_{43} = 0.3x0.2287 = 0.0686$
$X_{44} = 0.3x0.3050 = 0.0915$
$X_{45} = 0.3x0.3812 = 0.1143$
...
$X_{410} = 0.3x0.3812 = 0.1143$

C5

$X_{51} = 0.2x0.3266 = 0.0653$
$X_{52} = 0.2x0.2449 = 0.0489$
$X_{53} = 0.2x0.4082 = 0.0816$
$X_{54} = 0.2x0.3266 = 0.0653$
$X_{55} = 0.2x0.3266 = 0.0653$
...
$X_{510} = 0.2x0.2449 = 0.0489$

The weighted normalization results can be seen in Table 6 below:

Table 6. Weight Normalized Value

No	Alterna-tive	C1	C2	C3	C4	C5
1	A1	0,0634	0,0538	0,0269	0,0686	0,0653
2	A2	0,0793	0,0538	0,0269	0,0686	0,0489
3	A3	0,0793	0,0538	0,0269	0,0686	0,0816
4	A4	0,0793	0,0718	0,0359	0,0915	0,0653
5	A5	0,0634	0,0898	0,0449	0,1143	0,0653
6	A6	0,0476	0,0538	0,0269	0,1143	0,0816
7	A7	0,0634	0,0898	0,0449	0,1143	0,0653
8	A8	0,0475	0,0538	0,0269	0,0457	0,0489
9	A9	0,0475	0,0359	0,0179	0,1143	0,0489
10	A10	0,0475	0,0538	0,0269	0,1143	0,0489
Optimum		Min	Min	Min	Max	Max

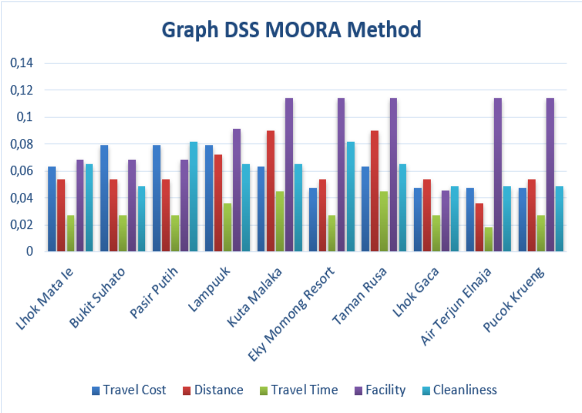


Figure 2. Calculation With MOORA Method Results

7. Calculating preference values.
   To calculate the preference value, equation 3 will be used as follows:

$$Y_i = \sum_{j=1}^{g} W_j X_{ij} - \sum_{j=g+1}^{n} W_j X_{ij}$$

   It's mean we will calculate for each alternative with MOORA ratio score = (sum of weighted normalized values for benefit criteria) – (sum of weighted normalized values for cost criteria).
   The results of the preference value calculations can be seen in Table 7 below:

Table 7. Ratio System (MOORA Score)

No.	Alter native	Max (C4+C5)	Min (C1+C2+C3)	Yi=Max-Min
1	A1	0.1339	0.1441	-0.0102
2	A2	0.1175	0.16	-0.0425
3	A3	0.1502	0.16	-0.0098
4	A4	0.1568	0.187	-0.0302
5	A5	0.1796	0.1981	-0.0185
6	A6	0.1959	0.1283	0.0676
7	A7	0.1796	0.1981	-0.0185
8	A8	0.0946	0.1282	-0.0336
9	A9	0.1632	0.1013	0.0619
10	A10	0.1632	0.1282	0.0350

8. Ranking Results
   Based on the analysis and calculations using the MOORA method with the *Ratio System* approach, Eky Momong Resort emerged as the best tourism destination in Aceh Besar. This alternative ranked first with the highest optimization value of 0.0676, followed by Air Terjun Elnaja in second place with an optimization value of 0.0619, Pucok Krueng in third place with 0.0350, and Pasir Putih in fourth place with -0.0098, as presented in Table VIII. These findings highlight that Eky Momong Resort demonstrates a more prominent advantage

compared to other alternatives in meeting the established criteria.

Table 8. Rank Results

No.	Alternative	Yi = Max-Min	Rank
1	A1	-0.0102	5
2	A2	-0.0425	10
3	A3	-0.0098	4
4	A4	-0.0302	8
5	A5	-0.0185	6
6	A6	0.0676	1
7	A7	-0.0185	7
8	A8	-0.0336	9
9	A9	0.0619	2
10	A10	0.0350	3

In addition to the calculation process carried out using the *Ratio System* approach, the analysis can also be performed using the *Reference Point Approach* (*Euclidean Distance*). The calculation process using the *Reference Point Approach* is as follows:

a. Determining the *Reference Point* (ideal value):
   - For *benefit* criteria : take the maximum value from the weighted normalized matrix.
   - For *cost* criteria : take the minimum value from the weighted normalized matrix.

   The weighted normalized matrix is presented in Tabel VI.

b. Calculating the deviation of each alternative from the RP using the corresponding equation:

$$d_{ij} = (x_{ij} - RP_j)^2$$

where:

xij : weighted normalized value of alternative i criterion j

RPi : *Reference Point* value on criterion j

c. Summing the squared deviations for each criterion using the corresponding equation:

$$D_i = \sum_{j=1}^{m} (x_{ij} - RP_j)^2$$

d. Computing the square root of the total squared deviations to obtain the *Euclidean Distance*, as expressed in the corresponding equation:

$$\mathrm{ED_i} = \sqrt{D_i}$$

The results obtained using the Euclidean Distance approach identified four tourism destinations with the shortest distance to the reference point, namely: first, Eky Momong Resort with a distance value of 0.0201; second, Air Terjun Elnaja with 0.0327; third, Pucok Krueng with 0.0383; and fourth, Lhok Mata Ie with 0.0549, as presented in Table IX.

Table 9. *Euclidean Distance* Value

No.	Alternative	Euclidean Distance	Rank
1	A1	0.0549	4
2	A2	0.0676	9
3	A3	0.0592	6
4	A4	0.0584	5
5	A5	0.0644	7
6	A6	0.0201	1
7	A7	0.0644	7
8	A8	0.0786	10
9	A9	0.0327	2
10	A10	0.0383	3

For the calculation using the *Ratio System* and the *Reference Point Approach*, the results were consistent for the rankings of alternative A6, A9, and A10. However, a variation was observed in the fourth-ranked alternative. This discrepancy arises from the distinct evaluation mechanism of the two approaches. In the *Ratio System*, the calculation is carried out by subtracting the total normalized values of the cost criteria from the benefit criteria, thereby emphasizing the overall difference in values. In contrast, the *Reference Point Approach* (*Euclidean Distance*) evaluates results based on the distance of each alternative from the ideal values of each criterion (maximum for benefits and minimum for costs). Consequently, the Euclidean Distance approach places greater emphasis on the geometric proximity of an alternative to the multidimensional ideal solution, rather than solely on the aggregate difference.

Although there is a difference in the fourth-ranked alternative (Pasir Putih in the Ratio System and Lhok Mata Ie in the Euclidean Distance), both calculation approaches consistently recommend the same three main tourist destinations, namely Eky Momong Resort, Air Terjun Elnaja, dan Pucok Krueng. The consistency indicates that these three destinations can be considered as the primary recommendations. Meanwhile, the difference observed from the fourth rank onward may be regarded as additional or alternative options, depending on the stakeholders preferences in prioritizing either the overall difference in criteria values or the proximity to the ideal condition.

The authors attempts to implement the MOORA calculation process using the *Ratio System* approach with HTML, CSS, and JavaScript as the programming language to enable we-based access, while utilizing Visual Studio Code as he text editor for web design development. The objective is to simplify the calculation of the MOORA method without the need for manual calculation.

The web-based MOORA decision-making system is designed with a user-friendly interface to enhance accessibility and comprehension. It is capable of executing the complete calculation process, ranging from normalization to final ranking, in an efficient and systematic manner. The system enables users to clearly observe each computational step, perform interactive simulations with multiple alternatives and criteria, and obtain ranking results that are both transparent and reliable. Consequently, this system can be regarded as a prototype of a decision support application that demonstrates practical relevance and offers potential for further enhancement and adaptation across diverse cases and organizational contexts.

The implementation of the web-based system that has been created is as follows:

1. Login Page
   This page displays the login screen, where you enter your username and password. This page plays an important role in maintaining data security and system integration. Designed to ensure that the security of the travel destination recommendation system data is maintained, users must confirm their identity by entering their name and password, as shown in the following image.

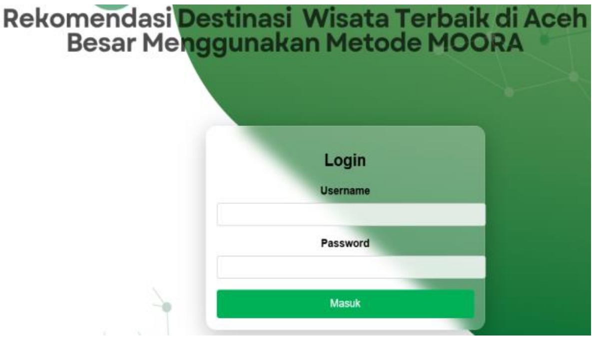


Figure 3. Login Page

2. Main Page
   Users will be directed to a page displaying several menus, namely Alternatives, Criteria, Assessment, and Calculation. This page contains a representation of the workflow in the destination recommendation process as well as a functional user dashboard for the data input stage, as shown in the following image.

Figure 4. Main System Page

3. Alternative Menu Page
   This page displays a list of recommended tourist destinations in Aceh Besar. This alternative data will be used for further evaluation and ranking using the MOORA method, as shown in the following image.

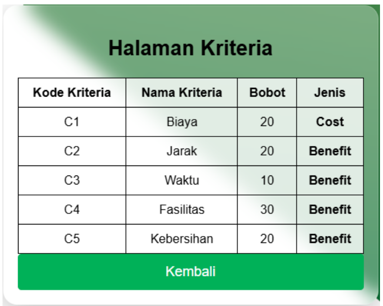
Halaman Alternatif

No	Kode	Nama
1	A1	Lhok Mata Ie
2	A2	Bukit Suhartoe
3	A3	Pasir Putih
4	A4	Lampuuk
5	A5	Kuta Malaka
6	A6	Eky Momong Resort
7	A7	Taman Rusa
8	A8	Lhok Gaca
9	A9	Air Terjun Elnaja
10	A10	Pucoek Krueng

Kembali

Figure 5. Alternative Menu Page

4. Criteria Menu Page
   This page displays a list of criteria, weights, and types to evaluate each tourist destination. This list is used to assess each tourist destination. The goal is to help users understand the MOORA calculation parameters and the importance of each criterion, as shown in the image below.



Halaman Kriteria

Kode Kriteria	Nama Kriteria	Bobot	Jenis
C1	Biaya	20	Cost
C2	Jarak	20	Benefit
C3	Waktu	10	Benefit
C4	Fasilitas	30	Benefit
C5	Kebersihan	20	Benefit

Kembali

Figure 6. Criteria Menu Page

5. MOORA Decision Matrix Calculation Page
   This page displays the first page of the Decision Matrix calculation, which contains the values of each destination alternative for each criterion (C1 to C5). The data in this matrix is the initial input that will be further processed through the normalization stage. Organizing the initial data to be processed includes the value of each alternative tourist destination for each criterion. This value is then used in the next normalization stage in the MOORA method calculation. The display can be seen in the following image.

1. Matriks Keputusan

No	Nama	C1	C2	C3	C4	C5
1	Lhok Mata Ie	4	3	3	3	4
2	Bukit Suhartoe	5	3	3	3	3
3	Pasir Putih	5	3	3	3	5
4	Lampuuk	5	4	4	4	4
5	Kuta Malaka	4	5	5	5	4
6	Eky Momong Resort	3	3	3	5	5
7	Taman Rusa	4	5	5	5	4
8	Lhok Gaca	3	3	3	2	3
9	Air Terjun Elnaja	3	2	2	5	3
10	Pucoek Krueng	3	3	3	5	3

Figure 7. Decision Matrix Calculation Page

6. MOORA Calculation Page Matrix Normalization
   Decision values have been normalized to equalize the scale between criteria. This page displays normalized decision values, the mathematical results of decision matrix calculations. This ensures that data comparisons are evenly distributed across various scales, resulting in objective goals. The display is as follows.

2. Normalisasi Matriks

No	Nama	C1	C2	C3	C4	C5
1	Lhok Mata Ie	0.3172	0.2694	0.2694	0.2287	0.3266
2	Bukit Suharto	0.3965	0.2694	0.2694	0.2287	0.2449
3	Pasir Putih	0.3965	0.2694	0.2694	0.2287	0.4082
4	Lampuuk	0.3965	0.3592	0.3592	0.3050	0.3266
5	Kuta Malaka	0.3172	0.4490	0.4490	0.3812	0.3266
6	Eky Momong Resort	0.2379	0.2694	0.2694	0.3812	0.4082
7	Taman rusa	0.3172	0.4490	0.4490	0.3812	0.3266
8	Lhok Gaca	0.2379	0.2694	0.2694	0.1525	0.2449
9	Air Terjun Elnaja	0.2379	0.1796	0.1796	0.3812	0.2449
10	Pucoek Krueng	0.2379	0.2694	0.2694	0.3812	0.2449

Figure 8. Normalized Matrix Calculation Page

7. MOORA Calculation Page Optimization Value (Yi)
   The Yi value is the final result of adding the weighted benefit criteria values minus the weighted cost criteria values. The Yi value is the main matrix that will be used to determine the final ranking of each alternative. It displays a table consisting of two main columns, namely "Alternative Name" and "Yi Value." The "Alternative Name" column lists the ten tourist attractions that are the objects of the study, while the "Yi Value" column displays the optimization results that have been calculated for each destination. The Yi value is a quantitative representation of the performance of each alternative based on benefits (distance, time, facilities, and cleanliness) and costs. This display serves as a link between the normalization and ranking stages. Therefore, the Yi value will be the basis for determining the final ranking, as shown in the following figure.

3. Nilai Optimisasi (Yi)

No	Nama Alternatif	Nilai Yi
1	Lhok Mata Ie	0.1513
2	Bukit Suharto	0.1191
3	Pasir Putih	0.1518
4	Lampuuk	0.1853
5	Kuta Malaka	0.2510
6	Eky Momong Resort	0.2293
7	Taman rusa	0.2510
8	Lhok Gaca	0.1280
9	Air Terjun Elnaja	0.1697
10	Pucoek Krueng	0.1966

Figure 9. Preference Value Calculation Results Page

8. Rank Page
   This page displays tourist destinations sorted by optimization value (Yi) from highest to lowest. This ranking directly presents recommendations for the best tourist destinations based on predetermined criteria and weights, sorted from highest to lowest value. This display aims to make it easier for tourists to quickly and objectively identify the best tourist destinations in Aceh Besar based on the established criteria and weights. Based on the calculations performed above, the top-ranked recommended tourist destination in Aceh Besar is Kuta Malaka, followed by Taman Rusa in second place and Eky Momong in third place. The display can be seen in the image below.

4. Perangkingan

Peringkat	No	Nama Alternatif	Nilai Yi
1	5	Kuta Malaka	0.2510
2	7	Taman rusa	0.2510
3	6	Eky Momong Resort	0.2293
4	10	Pucoek Krueng	0.1966
5	4	Lampuuk	0.1853
6	9	Air Terjun Elnaja	0.1697
7	3	Pasir Putih	0.1518
8	1	Lhok Mata Ie	0.1513
9	8	Lhok Gaca	0.1280
10	2	Bukit Suharto	0.1191

Figure 10. Alternative Ranking Page

4. Conclusion

The graphical results of the MOORA method illustrate the weighted normalized values for each criterion travel cost, distance, travel time, facilities, and cleanliness across ten alternative tourist destinations in Aceh Besar. The visualization highlights that facilities and cleanliness are the most influential criteria in differentiating the alternatives, whereas cost, distance, and time contribute relatively smaller variations.

Eky Momong Resort, Air Terjun Elnaja, and Pucok Krueng consistently achieve higher scores, particularly in term of facilitis and cleanliness, thus dominating the final ranking outcomes. Pasir Putih also demonstrates competitiveness due to its relatively high cleanliness score. In contrast, alternatives such as Lhok Gaca and Bukit Suharto exhibit weaker performance in facility and cleanliness attributes, which places them in lower ranks.

Therefore, the graphical analysis confirms that Eky Momong Resort, Air Terjun Elnaja, and Pucok Krueng emerge as the top three recommended destinations thar optimally satisfy the evaluation criteria, while other destinations may serve as supplementary options depending on stakeholder preferences.

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