DIJEMSS: Dinasti International Journal of Education Management and Social Science
E-ISSN: 2686-6331
P-ISSN: 2686-6358
https://dinastipub.org/DIJEMSS dinasti.info@gmail.com +62 811 7404 455
DINASTI PUBLISHER
DOI: https://doi.org/10.38035/dijemss.v6i2

Decision Support System For Determining Smart Fishery Village Tourism Development Priorities Using Ahp And Topsis Methods

Jefri Putri Nugraha[1], Djoko Surahmat[2], Wahyu Puji Astiyani[3], Nasrun[4], Mula Tumpu[5], Nova Magdalena Tumanduk[6], Rakhma Fitria Larasati[7].
[1]Politeknik Kelautan dan Perikanan Sidoarjo, Sidoarjo, Indonesia, jputrinugraha@gmail.com
[2]Politeknik Kelautan dan Perikanan Sidoarjo, Sidoarjo, Indonesia, djoko.surahmat@gmail.com
[3]Politeknik Kelautan dan Perikanan Pangandaran, Pangandaran, Indonesia, wahyupujiastiyani@gmail.com
[4]Akademi Komunitas Kelautan dan Perikanan Wakatobi, Wakatobi, Indonesia, nasrun@kkp.go.id
[5]Politeknik Kelautan dan Perikanan Dumai, Dumai, Indonesia, mulatumpu7@gmail.com
[6]Politeknik Kelautan dan Perikanan Bitung, Bitung, Indonesia, novatumanduk29@gmail.com
[7]Politeknik Kelautan dan Perikanan Jembrana, Jembrana, Indonesia, rakhmafitrialarasati@gmail.com

Corresponding Author: jputrinugraha@gmail.com

Abstract: The objective of this research is to obtain accurate results in determining the development of the Smart Fisheries Village as a superior tourist destination, through the implementation of a decision support system using AHP (Analytic Hierarchy Process) and the Order Preference by Similarity to Ideal Solution Method (TOPSIS) technique. This research was carried out in 5 village-based Smart Fisheries Village locations spread across several areas of East Java using descriptive qualitative research methods. Based on the results of the analysis that has been carried out, the village SFV results are obtained is at the pilot tourism village level, namely SFV Kendalbulur Village; at the developing tourist village level are SFV Sumberdodol Village and SFV Mangunegara Village; and at the advanced tourism village level are SFV Panembangan Village and SFV Kawali Village

Keyword: Analytic Hierarchy Process, TOPSIS technique, Smart Fisheries Village

INTRODUCTION

In support of the national development program, the Ministry of Maritime Affairs and Fisheries is promoting the Smart Fisheries Village program which is an effort to support the implementation of blue economy-based priority programs (Khairunisa et al., 2023) through digital-based economic development by providing talent and small and medium enterprise (SME) technical guidance. marine and fisheries (Yusuf, 2023). The Smart Fisheries Village program, an innovative initiative aimed at enhancing the independence of Indonesia's marine and fisheries communities to become more modern and productive (Nurfitriana, 2023). This Smart Fisheries Village program is a concept for developing fishing villages based on the application of sustainable information and communication technology and effective management to improve the economy and foster social change within rural communities, combining fisheries activities with tourism. A tourist village is a form of integration between the potential for natural tourist attractions, cultural tourism and man-made tourism in one particular area supported by attractions, accommodation and other facilities according to the local wisdom of the community (Hadi et al., 2022) (Fasa et al., 2022) and has a contribution to optimizing its potential by involving participation from the community through empowering village communities in improving the economy (Kirana and Artisa, 2020) (Suswanta et al., 2020).

Tourism development must continue to be pursued as a sub-sector capable of boosting both the national and regional economies. The rapid advancement of information technology has required the tourism industry and various other sectors to adopt it (Ananda, 2021). Currently, information technology is advancing rapidly, not only in hardware and software but also in computational methods. One notable computational method gaining traction is the Decision Support System (DSS) (Umar et al., 2018) is a computer-based information system for management decision making (Busthomy, et al., 2016) which provides information, modeling and data manipulation to assist decision making (Rohandi, et al., 2017) which can be used in various types of decisions, starting from simple to complex (Sumaryanti and Nurcholis, 2020). DSS is an information system developed to interact with its users, with Multi-Criteria Decision Making (MCDM) as one of its decision-making methods (Hozairi et al., 2023) who can choose the best decision alternative from a number of alternatives based on certain criteria (Gustriansyah, 2016) by considering more than one criterion or factor in choosing the best alternative (Asadabadi, et al., 2019).

In the development of the Smart Fisheries Village program, one decision-making challenge involving multiple criteria is the selection of priority tourism developments for the Smart Fisheries Village. In 2023, the Agency for Marine and Fisheries Extension and Development (BPPSDM KP) designated 10 village-based SFV locations across various regions in Indonesia, each highlighting key commodities from their respective areas. With an appropriate decision support system, recommendations for developing priority tourism sites within the Smart Fisheries Village can be effectively proposed. This allows decision-makers to map which Smart Fisheries Villages are already developed and which need attention and support for further development. The method used for weighting criteria in this research is the Analytical Hierarchy Process (AHP). AHP is a well-known method in DSS, forming a functional hierarchy with human perception as its primary input, wherein experts provide weights for each criterion (Arfan et al., 2023).

The Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method offers advantages such as its simple and easily understood concept, efficient computation, and ability to measure the relative performance of decision alternatives in a straightforward mathematical form (Putra et al., 2020). Various studies have examined the combination of AHP-TOPSIS methods and found that these approaches yield favorable results.

Based on the above description, a computerized system is needed that contains comprehensive information on tourism areas within the Smart Fisheries Village. This system would use a decision support system method to determine development priorities for Smart Fisheries Village tourism sites that are already developed and those requiring further development, employing the AHP and TOPSIS methods. The purpose of this research is to obtain accurate results in determining the development of priority tourism sites within the Smart Fisheries Village through the implementation of a decision support system using the Analytic Hierarchy Process (AHP) and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) methods. This research provides a solution for prioritizing Smart Fisheries Village development, enabling targeted and effective development efforts.

METHOD

Time and Location of the Research

This research will be conducted at five village-based Smart Fisheries Village (SFV) locations spread across various regions in East Java. However, due to limitations in time, funding, and manpower, the research will be conducted in a hybrid format. Data from some research locations will be collected online, in coordination with the SFV representatives at each location. The study will span 12 months, from January 2024 to December 2024. The research will employ the Analytic Hierarchy Process (AHP) and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) methods to determine the priority development of tourism sites within the Smart Fisheries Villages.

Type of Research

In this study, the author employs a qualitative descriptive research method. Qualitative descriptive research aims to describe and illustrate existing phenomena, whether natural or human-made, focusing on characteristics, quality, and the relationships among activities. This type of research does not involve treatment, manipulation, or alteration of the variables studied but rather describes conditions as they are. The only treatment applied is the research itself, conducted through observation, interviews, and documentation (Afrizal, 2016).

Given the results the study aims to achieve, this is an applied research type focused on implementing a ranking method to support multi-criteria decision-making. After data collection, the researcher will process the data using the Analytical Hierarchy Process (AHP) method to obtain criterion weights, and the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method will be used to generate alternative rankings for determining priority development in the Smart Fisheries Village tourism sites.

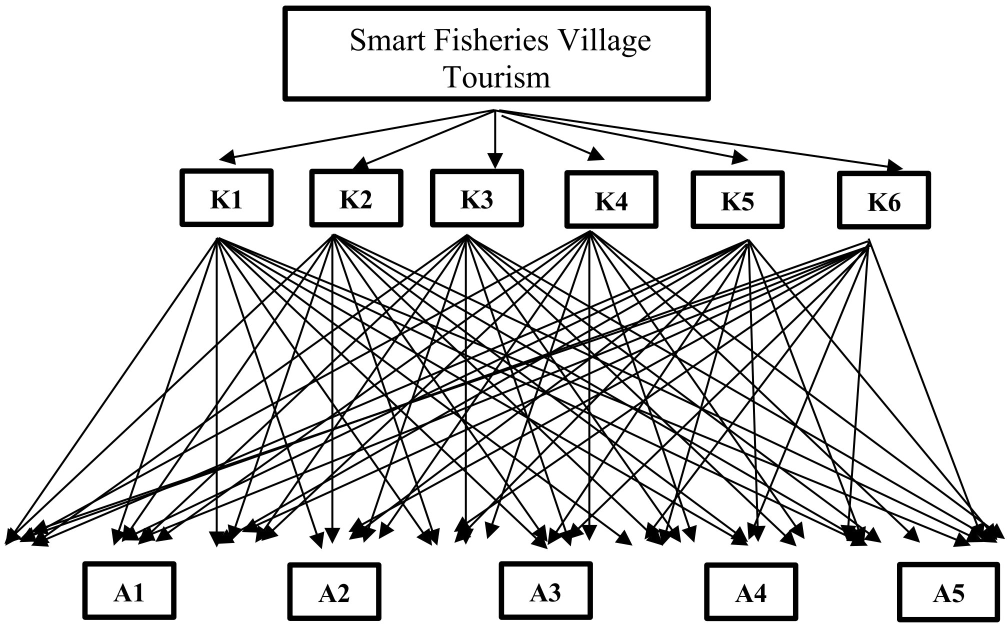
Research Procedure

The steps (procedure) followed in this research are as follows:

1. Literature review, conduct a review of journals, books, and articles from the internet related to the Analytical Hierarchy Process (AHP) method, the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method, and the Smart Fisheries Village (SFV) program.
2. Data collection, the data collection methods in this study include:
   a. Interviews. Interviews are one of the most common methods for collecting data in social research. In this study, interviews are conducted with local stakeholders, the tourism awareness group (pokdarwis), and other relevant parties. These interviews aim to provide deeper insights into criteria and preferences related to Smart Fisheries Village tourism destinations.
   b. Documentation. This data consists of documentation on the development of the Smart Fisheries Village program in five locations across Java Island.
   c. Literature study. The literature study involves searching various written sources, such as books, magazines, articles, journals, or documents relevant to the research problem. The information gathered from this study serves as a reference to strengthen the existing arguments (Putra et al., 2020).
3. Data analysis, data analysis is conducted after all data has been collected, using the fundamental principles of the AHP-TOPSIS method. The stages of data analysis are as follows:
   a. Determining criteria. The criteria in this study include:
      1) Tourism and general facilities;
      2) Availability of resources and tourism appeal;

   3) Accessibility;
   4) Community readiness and involvement;
   5) Market potential; and
   6) Strategic positioning of tourism within regional development. These criteria are adapted from the Ministry of Culture and Tourism Regulation No. PM.37/UM.001/MKP/07 on criteria for establishing priority tourism destinations.

b. Determining alternative options. The alternatives in this study are:
   1) Mangunegara Village, Mrebet, Purbalingga Regency, Central Java;
   2) Sumberdodol Village, Panekan, Magetan Regency, East Java;
   3) Panembangan Village, Cilongok, Banyumas Regency, Central Java;
   4) Kendalbulur Village, Boyolangu, Tulungagung Regency, East Java;
   5) Kawali Village, Ciamis Regency, West Java
c. Creating a hierarchical structure. Begin with the main goal as the starting point for the hierarchy structure (as shown in Figure 1).



Source: Research Results
Figure 1. The Hierarchy Structure

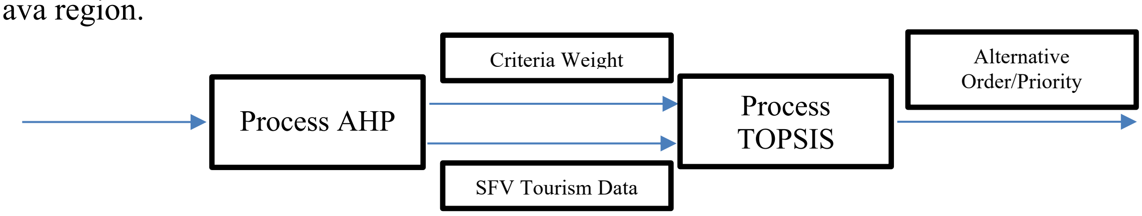
d. Creating a decision matrix. Construct a decision matrix with columns representing each alternative and rows representing each criterion. The values within the decision matrix indicate the extent to which each alternative fulfills a specific criterion. This matrix serves as the foundation for further analysis, allowing a comparative assessment of each alternative against the selected criteria.
e. Normalize the decision matrix. Normalize the decision matrix by calculating the relative values of each alternative against each criterion. This step adjusts the values so that they are comparable across different criteria scales.
f. Calculate the weighted normalized decision matrix. Multiply the normalized values of each alternative by the respective weight of each criterion to create the weighted normalized decision matrix.
g. Identify positive and negative ideal solutions. Identify the positive ideal solution (PIS) and negative ideal solution (NIS). The PIS is the alternative closest to the ideal positive value for each criterion, while the NIS is the alternative furthest from the ideal positive value for each criterion.

h. Calculate the distance to the ideal solutions. Calculate the euclidean distance of each alternative from both the positive and negative ideal solutions.
i. Calculate the relative preference value. Determine the relative preference value for each alternative by dividing the distance of the alternative from the negative ideal solution by the sum of its distances from both the negative and positive ideal solutions.

In this study, the interview or questionnaire responses from sources are translated into a pairwise comparison matrix using Saaty's scale, and normalization is applied to derive weights using the AHP method (Mahendra and Sari, 2019). The TOPSIS method is used for ranking; data from tourism villages is normalized, and preference values are calculated based on alternative data and criterion weights. The prediction results yield a ranked list of Smart Fisheries Villages, displayed in a table ordered by the best recommendation scores, where lower preference values indicate higher recommendations (Kusbiantoro et al., 2020).

RESULTS AND DISCUSSION

As explained in the previous chapter, this study uses two methods, AHP and TOPSIS, to determine the priority development of Smart Fisheries Village (SFV) tourism sites. The integration scheme between these two methods is shown in Figure 2. In the initial stage, the criteria data, tailored to the type and conditions of each location, are processed using the AHP method. The output of this method provides the weight of each criterion. These weights, obtained through AHP calculations, serve as input for the TOPSIS calculation process, along with profile data of the Smart Fisheries Village (SFV) tourism sites. In the TOPSIS calculation process, the positive ideal distance and negative ideal distance are calculated. The final output will be a ranked list or priority order of Smart Fisheries Village (SFV) tourism sites within the Java region.



Source: Research Results
Figure 2. Integration of AHP and TOPSIS Methods

Application of the AHP Method

Identify Criteria

In the AHP method process, the identification of criteria is carried out through interviews and discussions with respondents. The questionnaire is developed based on the findings from the literature review conducted earlier regarding the criteria for establishing priority tourism destinations. Below is an explanation of each criterion:

Table 1. Explanation of Each Criterion

No.	Criteria	Description
1	Tourism and General Facilities	Tourism facilities in Smart Fisheries Village (SFV) refer to services and amenities specifically designed to meet the needs of tourists, such as accommodations, restaurants, and information centers. General facilities refer to basic infrastructure used by everyone, such as roads, toilets, and parking areas.
2	Availability of Resources and Tourism Appeal	The availability of resources in Smart Fisheries Village (SFV) refers to the natural potential and facilities that support tourism activities, such as fishing and natural beauty, while tourism appeal encompasses unique features that attract

		visitors, such as distinctive scenery, local culture, and engaging activities.
3	Accessibility	Accessibility in Smart Fisheries Village (SFV) refers to how easily tourists can reach the tourism location, including road conditions, transportation options, and clear directions.
4	Community Readiness and Involvement	Community readiness and involvement in Smart Fisheries Village (SFV) indicate the extent to which local residents are prepared to support, participate in, and actively manage and develop tourism in their village.
5	Market Potential	Market potential in Smart Fisheries Village (SFV) refers to opportunities to attract various segments of tourists based on their interests in fisheries-based tourism, local culture, and ecotourism, which can support economic growth in the village.
6	Strategic Positioning of Tourism in Regional Development	The strategic positioning of tourism in regional development within Smart Fisheries Village (SFV) highlights the important role of tourism as a key driver of local economic growth, job creation, and the sustainable improvement of infrastructure to advance the well-being of local communities.

Source: Research data

Decision Hierarchy

The next step is to create a decision hierarchy structure. The AHP hierarchical structure is structured to assist in decision making. This is prepared by taking into account all the decision criteria involved in the system. The hierarchical structure divides the problem into separate elements. A problem faced can be broken down into parts which are the main elements and then arranged again into other parts and so on. At the leftmost level of the hierarchy, the goals or objectives of the system are stated for which a solution to the problem will be sought. Then, the next level is an explanation of these goals.

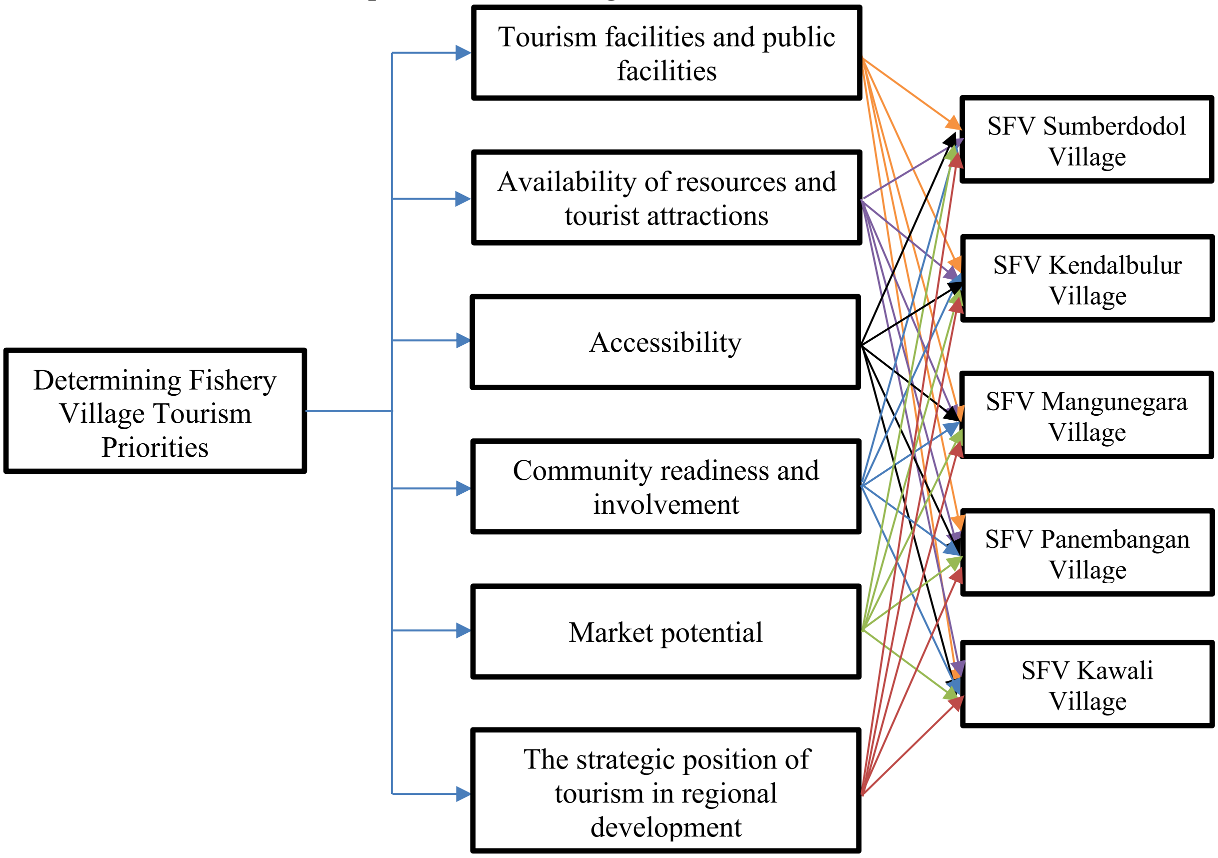


Figure 3. Decision Hierarchy Structure

From the hierarchical structure in Figure 3, it can be seen that the main goal to be achieved is to determine priorities for developing smart fisheries village tourism according to the level of tourist village classification, starting from pioneering tourist villages, developing tourist villages, advanced tourist villages and independent tourist villages. The influencing criteria have been determined based on Culture and Tourism Regulation number PM.37/UM.001/MKP/07 concerning criteria for determining superior tourism destinations, namely Availability of tourist resources and attractions, Tourism facilities and public facilities, Accessibility, Community readiness and involvement, market potential, and strategic position of tourism in regional development.

Pairwise Comparison Matrix

The value for each criterion is obtained by comparing the level of importance of each criterion against other criteria or what can be called a pairwise comparison. In carrying out pairwise comparisons, this was done by distributing a second questionnaire. The respondents used in this questionnaire are the same as the first questionnaire. The results of comparing the level of importance of each criterion against other criteria will then be entered into a pairwise comparison matrix. The numbers in the matrix are the sum of the numbers in the results of the second questionnaire which have been multiplied by the value of each respondent. The respondent values used are R1 = 40%, R2 = 30%, R3 = 15%, and R4 = 15%. The results of the pairwise comparison assessment for each criterion can be seen in Table 2.

Table 2. Pairwise Comparison Matrix for Each Criteria

Criteria	K1	K2	K3	K4	K5	K6
Tourism facilities and public facilities (K1)	1	0,19	0,716	0,189	1,693	2,344
Availability of resources and tourist attractions (K2)	5,263	1	0,815	0,535	2,828	4,289
Accessibility (K3)	1,397	1,227	1	0,938	1,256	2,344
Community readiness and involvement (K4)	5,291	1,869	1,066	1	4,131	3,311
Market potential (K5)	0,590	0,354	0,796	0,242	1	3,066
The strategic position of tourism in regional development (K6)	0,427	0,233	0,427	0,302	0,326	1

Source: Research data

It can be seen in Table 2 that the criteria for availability of resources and tourist attractions (K2) are 5.263 times more important or more influential than the criteria for tourism facilities and public facilities (K1). Meanwhile, the criteria for tourism facilities and public facilities (K1) are 0.19 times more important or more influential than the criteria for availability of resources and tourist attractions (K2), etc

Criteria Weight Calculation

After carrying out pairwise comparison calculations, the next step is: carry out weight calculations for each criterion. This weight will later be used as input in subsequent calculations using the TOPSIS method. Based on the previous matrix calculation table, the first stage in the process of calculating the criteria weights is by adding up the values in each column, the calculation results can be seen below in Table 3.

Table 3. Addition of Values for Each Column

Criteria	K1	K2	K3	K4	K5	K6
Tourism facilities and public facilities (K1)	1	0,19	0,716	0,189	1,693	2,344
Availability of resources and tourist attractions (K2)	5,263	1	0,815	0,535	2,828	4,289
Accessibility (K3)	1,397	1,227	1	0,938	1,256	2,344
Community readiness and involvement (K4)	5,291	1,869	1,066	1	4,131	3,311
Market potential (K5)	0,590	0,354	0,796	0,242	1	3,066
The strategic position of tourism in regional development (K6)	0,427	0,233	0,427	0,302	0,326	1
Total	**18,832**	**7,962**	**6,895**	**6,2198**	**13,581**	**18,791**

Source: Research data

After getting the total value for each column, the next stage is to carry out the normalization calculation process. The first is by dividing the value of each matrix (aij) by the total value in the column of each matrix (aij) by the total value in the matrix column that we calculated previously (Zj).

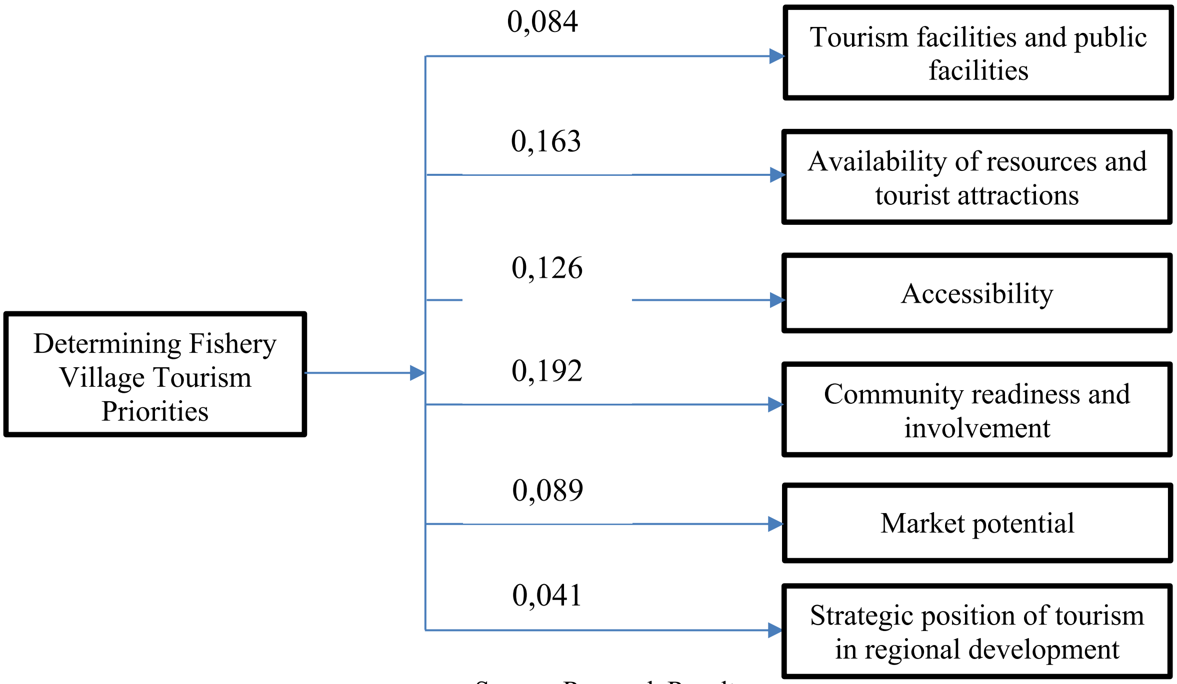
With the results of these calculations, the next step is to find the vector element values. The method is to divide the normalization value that we previously calculated by the number of criteria used in this research. Because the number of criteria in this research is 6, it will be divided by 6. The overall results of calculations in finding normalization values and vector elements at this stage can be seen in Table 4.

Table 4. Normalization and Vector Element Calculation Results

Criteria	K1	K2	K3	K4	K5	K6	Total	Wi
Tourism facilities and public facilities (K1)	0,053	0,024	0,104	0,03	0,125	0,099	0,758	0,084
Availability of resources and tourist attractions (K2)	0,279	0,126	0,118	0,086	0,208	0,181	1,465	0,163
Accessibility (K3)	0,074	0,154	0,145	0,151	0,092	0,099	1,134	0,126
Community readiness and involvement (K4)	0,281	0,235	0,155	0,161	0,304	0,140	1,728	0,192
Market potential (K5)	0,031	0,044	0,115	0,039	0,074	0,130	0,797	0,089
The strategic position of tourism in regional development (K6)	0,023	0,029	0,062	0,049	0,024	0,042	0,365	0,041
Total	**1**	**1**	**1**	**1**	**1**	**1**	**6**	**1**

Source: Research data

From Table 4 it can be seen that the criteria have the most weight value large, namely the criteria for community readiness and involvement with a weight value of 0.192. The second highest weight value after the criteria for readiness and community involvement is the criteria for availability of resources and tourist attractions with a weight value of 0.163, next is the accessibility criterion with a weight value of 0.126, followed by the criteria for market potential at 0.089, tourism facilities and public facilities at 0.084 , and finally the one with the lowest weight value is the criterion for the strategic position of tourism in regional development with a value of 0.041.



Source: Research Results

Figure 4. Decision Hierarchy Structure

Application of the TOPSIS Method

After carrying out calculations using the AHP method, the next step is: carry out calculations using the TOPSIS method. There is output data that has been obtained from AHP calculations which will later be used in calculations with using the TOPSIS method.

In the calculation process using the TOPSIS method there are several stage. In this first stage, namely by distributing the third questionnaire. Respondent asked to fill out a questionnaire. Respondents are used at this stage are the same respondents at the calculation stage using the AHP method. The questionnaire distributed contained respondents' assessments of the five smart fishing village tours. The form of this third questionnaire can be seen clearly in the Appendix. Each criterion has four levels of assessment. Below is an explanation of the four levels, namely:

Table 5. Criteria Level Classification

No	Criteria	Level-1 (Pioneer)	Level-2 (Develop)	Level-3 (Proceed)	Level-4 (Advanced)
1	Tourism facilities and public facilities (K1)	Tourist facilities are very limited, there are no adequate public facilities	Tourist facilities are starting to be developed, there are basic public facilities such as	Complete tourist and public facilities, such as restaurants, clean toilets, tourist information center,	Tourist facilities are very adequate and of international standard, including hotels/resorts,

		available, there are only basic facilities such as a simple parking area.	toilets and places of worship, but they are still limited in quantity and quality.	as well as adequate entertainment and recreation facilities.	health facilities, internet access and complete tourist services.
2	Availability of resources and tourist attractions (K2)	Tourist attractions are limited to unmanaged natural potential, minimal resource management.	Tourism resources and attractions are starting to be processed, for example several destinations have been managed and promoted even though they are still simple.	Tourist attractions are varied and professionally managed, including cultural, natural and educational tourism, with sufficient supporting resources.	Tourism resources are managed optimally, with integrated and innovative tourism development, offering unique, sustainable experiences.
3	Accessibility (K3)	Accessibility is very limited, road infrastructure is inadequate, public transportation is not yet available.	Accessibility is starting to improve, there are roads to tourist locations, but public transportation is still rare and limited.	Good road infrastructure and public transportation are available regularly, access to tourist locations is easy from various directions.	Very good accessibility with integrated toll roads, airports and public transportation, fast and easy access for domestic and international tourists.
4	Community readiness and involvement (K4)	The community has not been involved in tourism activities, tourism awareness is still low.	The community is starting to get involved in several tourism activities, such as providing accommodation or local products, but these are still limited.	Community involvement is quite high, they are active in managing local tourism, providing services, products and services that support tourism.	The community is very involved in all aspects of tourism, including management and promotion, and is the main actor in the development of sustainable tourism.
5	Market potential (K5)	The tourist market is still very limited, the majority of visitors are local tourists from the surrounding area.	The market is starting to develop, with tourists visiting from other areas, although still few.	The tourism market already includes national and regional tourists, destinations are starting to become widely known.	The tourism market is very broad, including international tourists with a stable and high level of visits.
6	Strategic position of tourism in regional development (K6)	Tourism has not been a priority in regional development, its contribution to the local economy is very small.	Tourism is starting to be considered in regional development plans, with several development programs planned.	Tourism is an important sector in regional development, making a significant contribution to regional income and opening up many job opportunities.	Tourism is the main sector that influences all aspects of regional development, with a major contribution to the economy, culture and environment.

Source: Research data

It can be seen based on Table 5 that each of the available criteria has four levels. Each criterion is divided into four parts. Where is Level 1 is the lowest level followed by Level 4 which is the highest level. These four levels are taken based on the Technical Guidelines for Assessment of Tourism Villages of the Ministry of Tourism and Creative Economy of the Republic of Indonesia.

Based on the division of levels in Table 6 below is an explanation regarding the assessment of all intelligent fishing village tourism, namely SFV Sumberdodol Village (S), SFV Kendalbulur Village (KD), SFV Mangunegara Village (M), SFV Penembangan Village (P), and SFV Kawali Village (KW). The results obtained are as follows.

Table 6. Criteria Assessment

No	Criteria	S	KD	M	P	KW
1	Tourism facilities and public facilities (K1)	Level 3	Level 1	Level 2	Level 3	Level 3
2	Availability of resources and tourist attractions (K2)	Level 3	Level 3	Level 3	Level 3	Level 2
3	Accessibility (K3)	Level 3	Level 1	Level 2	Level 2	Level 3
4	Community readiness and involvement (K4)	Level 3	Level 3	Level 2	Level 1	Level 3
5	Market potential (K5)	Level 3	Level 3	Level 1	Level 2	Level 2
6	Strategic position of tourism in regional development (K6)	Level 2	Level 3	Level 2	Level 2	Level 3

Source: Research data

After getting the values that each village we have get it beforehand by distributing the third questionnaire, then go to in the calculation process. In the calculation process using the method This TOPSIS has several stages. These stages can be seen below, namely as follows:

Calculating the Geometric Mean

After getting an assessment of each smart fishing village tourism (SFV) given by respondents, the next step is to calculate the geometric average. The method is to multiply the scores given based on level by the weight of each respondent. For the overall calculation results for SFV Sumberdodol Village (S), SFV Kendalbulur Village (KD), SFV Mangunegara Village (M), SFV Penembangan Village (P), and SFV Kawali Village (KW) against all criteria can be seen in Table 7:

Table 7. Geometric Mean Calculation Results

SFV Village	Criteria					
	1	2	3	4	5	6
S	2,823	3	2,5	2,544	3	2,656
KD	1,11	3	3,831	3,132	2,823	3,565
M	2,551	2,823	2,551	1,611	2,219	1,933
P	2,823	2,394	2,551	3	1,308	2,125
KW	3,213	2,259	3,27	1,933	3,27	2
Total	5,831	6,067	6,681	5,623	5,857	5,659

Source: Research data

Normalization Calculations

After calculating the geometric mean, the next calculation is to calculate the normalization matrix for the five Village SFVs. For the recapitulation of the results of calculating the normalized value (Rij) for the whole Village SFV can be seen in Table 8:

Table 8. Normalization Matrix

SFV Village	Criteria

	1	2	3	4	5	6
S	0,484	0,495	0,374	0,452	0,512	0,469
KD	0,19	0,495	0,573	0,557	0,482	0,63
M	0,437	0,465	0,382	0,286	0,379	0,342
P	0,484	0,395	0,382	0,534	0,223	0,223
KW	0,551	0,372	0,49	0,344	0,558	0,353

Source: Research data

Weighted Normalization Calculation

After calculating the normalization values, the next step is calculating the weighted normalization matrix. The method is to multiply the normalization matrix contained in Table 8 with the weight values previously obtained in the calculation process using the AHP method. The weights obtained in the AHP calculation can be seen in Table 9.

Table 9. Weighted Normalization Matrix

SFV Village	Criteria					
	0,084	0,163	0,126	0,192	0,089	0,041
	1	2	3	4	5	6
S	0,04	0,08	0,047	0,087	0,045	0,019
KD	0,016	0,08	0,072	0,107	0,043	0,026
M	0,036	0,076	0,048	0,055	0,034	0,014
P	0,04	0,064	0,048	0,102	0,02	0,015
KW	0,045	0,061	0,062	0,066	0,049	0,014

Source: Research data

Positive Ideal Solution and Negative Ideal Solution

After obtaining the weighted normalization matrix value, the next step is to find the value of the positive ideal solution (A+) and the negative ideal solution (A-). To get a positive ideal solution value, you need to look for the maximum value in each column in Table 9.

Meanwhile, to find the negative ideal solution value, you need to look for the minimum value in each column in Table 9. All positive ideal solution (A+) and negative ideal solution (A-) values in this study can be seen in Table 10:

Table 10. Recapitulation of A+ and A- Grades

	1	2	3	4	5	6
A+	0,045	0,08	0,072	0,107	0,049	0,026
A-	0,016	0,061	0,047	0,066	0,049	0,014

Source: Research data

Calculate the Distance Between Ai and the Positive Ideal Solution

After getting the A^+ and A^- values, the next step is to find the distance value between Ai and the positive ideal solution. The way to find the Di^+ value is by adding up all the squared values of the weighted normalization matrix value minus the A^+ value and then taking the root.

Calculating the Distance Between Ai and the Negative Ideal Solution

The next step is to find the distance value between Ai and the negative ideal solution. The way to find the Di- value is by adding up all the squared values of the weighted normalization matrix value minus the A- value and then taking the root.

For the overall calculation results in calculating the distance value between Y_ij and the positive ideal solution A^+ and the ideal solution A^- can be seen in table 11:

Table 11. Distance Y_ij with A^+ and A^-

SFV Village	D^+	D-
S	0,035	0,066

KD	0,031	0,082
M	0,076	0,031
P	0,055	0,057
KW	0,049	0,064

Source: Research data

Calculating Preference Value Vi

After previously getting the D+ and D- values, the next step is to calculate the Vi preference value. Where Vi is the closeness of each alternative to the ideal solution.

Calculating Percentages

This is the final step in calculations using the TOPSIS method. To get the percentage for each Village SFV, divide the Vi value by the total Vi value. For overall results in calculating the Vi value and each percentage value the Village SFV can be seen below in Table 12.

Table 12. Vi Value and Percentage Value

SFV Village	Vi	Presentation	Rating
S	0,569	20,627 %	3
KD	0,292	10,5995 %	5
M	0,5098	18,485 %	4
P	0,7299	26,466 %	1
KW	0,657	23,822 %	2
Total	**2,758**	**100%**	

Source: Research data

Village SFV Grouping

After carrying out calculations using the AHP and TOPSIS methods, the next step is to group all Village SFVs into 3 levels or tiers. These levels are Pioneer Tourism Villages, Developing Tourism Villages, and Advanced Tourism Villages. The division is divided based on the final percentage value obtained from the calculation results. The following is a calculation in determining the interval value in grouping Village SFV:

Interval = Highest Percentage Value - Lowest Percentage Value

Interval = 26,5 - 10,6 = 15,9

The interval value at the next level is obtained by adding returned a value of 15.9. For the results of the grouping of the five Village SFVs, see Table 13:

Table 13. Village SFV Classification

Level SFV Desa	Interval	SFV Desa
Pioneer Tourism Village	1 - 15,9	SFV KD Village
Developing Tourism Village	16 - 21,3	SFV Village S and SFV Village M
Advanced Tourism Village	21,4 - 26,7	SFV Village KW and SFV Village P

Source: Research data

Based on Table 13, it is found that there are Village SFVs that are is at the pioneer tourism village level, namely SFV Kendalbulur village. At the developing tourism village level it is SFV Sumberdodol village and SFV Mangunegara village, and at the advanced tourism village level it is SFV Panembangan village and SFV Kawali village. This classification is carried out to assess the progress and readiness of villages in developing fisheries-based tourism and the agribusiness potential within it. From the results of this classification, it can be concluded that there are various levels of development in each village, which are categorized into three levels, namely pioneer tourism villages, developing tourism villages, and advanced tourism villages.

To optimize the development of tourist villages, it is important for each village to exploit its potential and overcome the challenges that exist at each level of development.

CONCLUSION

Based on the results of the analysis that has been carried out, the village SFV results are obtained is at the pioneer tourism village level, namely SFV Kendalbulur village; at the developing tourist village level are SFV Sumberdodol village and SFV Mangunegara village; and at the advanced tourism village level are SFV Panembangan village and SFV Kawali village

REFERENCES

Afrizal. (2016). *Metode Penelitian Kualitatif: Sebuah Upaya Mendukung Penggunaan Penelitian Kualitatif dalam Berbagai Disiplin Ilmu*. Jakarta: Rajawali Pers.

Ananda, I., dan Dirgahayu, T. (2021). Pemanfaatan Teknologi Informasi Pada Desa Wisata Di Indonesia: A Systematic Literature Review. *Jurnal Teknik Informatika dan Sistem Informasi, 8(4), 2291-2302*.

Arfan, M., Takdir, R., Dai, R. H., Kaluku, M. R. A. (2023). Sistem Penunjang Keputusan Penentuan Prioritas Pembangunan Desa Dengan Metode AHP-TOPSIS. *Journal Of System and Information Technology, 3(1), 92-101*.

Asadabadi, M. R., Chang, E., and Saberi, M. (2019). Are MCDM Methods Useful ? A Critical Review of Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP). *Cogent Engineering, 6(1), 1-11*.

Busthomy, A., Sultoni., dan Hariyanto, R. (2016). Sistem Pendukung Keputusan Untuk Pemilihan Objek Wisata Di Kabupaten Pasuruan Dengan Menggunakan Metode Fuzzy. *Jurnal Informatika Merdeka Pasuruan , 2(1), 33-56*.

Fasa, A. W. H., Berliandaldo, M., dan Prasetio, A. (2022). Strategi Pengembangan Desa Wisata Berkelanjutan Di Indonesia: Pendekatan Analisis Pestel. *Jurnal Kajian, 27(1), 71-87*.

Gustriansyah, R., (2016). Sistem Pendukung Keputusan Pemilihan Dosen Berprestasi Dengan Metode ANP Dan TOPSIS. *Seminar Nasional Teknologi Informasi dan Komunikasi, 33-40*.

Hadi, M. J., Lume dan Widyaningrum, M. (2022). Pemetaan Potensi Wisata, Peluang dan Tantangan Pengembangan Desa Wisata Pengadangan Barat, Kabupaten Lombok Timur. *Journal of Tourism and Economic, 5(1), 32-45*.

Hozairi., Alim, S., Krisnafi, Y., Baskoro, F., Walid, M., dan Nazizah, F. (2023). *Sistem Pendukung Keputusan Multi Kriteria (Untuk Bidang Kelautan Dan Perikanan)*. Bandung: Widina Bhakti Persada.

Khairunnisa, A., Budiadnyani, I. G. A., Utari, S. P. S. D., Febrianti, D., Farida, I., Astiana, I., Samanta, P. N., Dewi, R. N., Panjaitan, F. C. A., Cesrany, M., Perceka, M. L., Bharata, M. T. A., Putri, N. M. A., Vitriani, N. M. E., Ardiyanti, P. A., Ardiarta, K. T., Adinata, I. P. G. S., dan Famau, Y. M. (2023). Inovasi Olahan Udang Di Wilayah Smart Fisheries Village Kombading, Jembrana, Bali. *Altifani Journal: International Journal of Community Engagement, 4(1), 20-29*.

Kirana, C. A. D., dan Artisa, R. A. (2020). Pengembangan Desa Wisata Berbasis Collaborative Governance Di Kota Batu. *Jurnal Administrasi Publik, 6(1), 1-17*.

Kusbiantoro, D. P. M. (2020). Implementasi Metode AHP Dan TOPSIS Untuk Rekomendasi Wisata Kota Batu. *Prosiding Seminar Informatika Aplikatif Polinema, 66-72*.

Mahendra, G. S., dan Sari, N. K. A. P. (2019). Perancangan Sistem Pendukung Keputusan Dengan Metode AHP-Vikor Dalam Penentuan Pengembangan Ekowisata Pedesaan. *Prosiding Seminar Nasional FTIS, UNHI, 15-34*.

Nurfitriana, N., Sayida, B. (2022). Pengembangan Wilayah Perikanan Berbasis Smart Fisheries Village (SFV) Di Desa Pulogading Kecamatan Bulakamba Kabupaten Brebes Provinsi Jawa Tengah. *Jurnal Sosial Ekonomi Pesisir, 4(2), 1-10*.

Putra, D. W. T., Santi, S. N., Swara, G. Y., dan Yulianti, E. (2020). Metode TOPSIS Dalam Sistem Pendukung Keputusan Pemilihan Objek Wisata. Jurnal Teknoif Teknik Informatika Institut Teknologi Padang, 8(1), 1-6.

Rohandi, M., Mail, M. Y. T., dan Jassin, M. R. T. (2017). Sistem Pendukung Keputusan dalam Penentuan Prioritas Pengembangan Kawasan Wisata Bawah Laut menggunakan AHP. *Jurnal Nasional Teknik Elektro dan Teknologi Informasi, 6(4), 2-8*.

Sumaryanti, L., dan Nurcholis. (2020). Analysis of Multiple Criteria Decision Making Method for Selection the Superior Cattle. *Intensif: Jurnal Ilmiah Penelitian dan Penerapan Teknologi Sistem Informasi, 4(1), 131-141*.

Suswanta., Atmojo, M. E., dan Sakir. (2020). Pengembangan Desa Wisata Edukatif Berbasis Budidaya Ikan Hias Di Dusun Kadisoro, Gilangharjo, Pandak, Bantul, Daerah Istimewa Yogyakarta. *Journal of Community Development & Empowerment, 1(1), 52-58*.

Umar, R., Fadlil, A. dan Yuminah. (2018). Sistem Pendukung Keputusan Dengan Metode AHP Untuk Penilaian Kompetensi Soft Skill Karyawan. *Khazanah Informatika: Jurnal Ilmu Komputer dan Informatika, 4(1), 27-34*.

Yusuf, M. (2023). Productivity Efficiency of Main Actors and KP Sector Business Actors through the Minapadi Smart Fisheries Village Program. *Indonesian Journal of Economic & Management Sciences. 1(1), 59-74*.