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ANALYTICAL HIERARCHY PROCESS (AHP): A STRATEGY TO DEVELOP DISASTER RESILIENT TOURISM PLANNING IN MAJENE, INDONESIA

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ABSTRACT
Majene Regency in Sulawesi Barat, Indonesia, ranks as one of the regions most susceptible to natural disasters, with its tourism sector highly exposed to these risks. Given that nearly all tourism destinations in the region lie within hazard-prone zones, the economic vulnerability of this sector is critical. This research aims to formulate a disaster-resilient tourism strategy for Majene by employing the Analytical Hierarchy Process (AHP), a decision-making framework that enables structured prioritization based on stakeholder input. The study involved twelve experts from government, academia, the private sector, and the local community who conducted pairwise comparisons of five strategic categories derived from the World Bank's disaster-resilient tourism framework: understanding risk, planning and prioritization, mitigation and preparedness, response and recovery, and long-term resilience actions. The results revealed that long-term resilience actions (22.7%), understanding risk (22.3%), and mitigation and preparedness (21.4%) were the top priorities. Key programs within these strategies include integrating tourism into national risk assessments, embedding tourism into disaster management planning, and establishing early warning systems. These findings offer actionable insights for local governments and tourism planners, highlighting strategic priorities that can guide policy development and foster sustainable, disaster-resilient tourism in vulnerable areas like Majene.
Keywords: *Disaster, Resilient, Tourism, Strategy, Majene*.

1. Introduction

Sulawesi Barat is a province in Indonesia with the highest level of disaster risk (BNPB, 2024), which is caused by high exposure to disaster hazards. Sulawesi Barat mainly has high exposure to geological disasters due to its location, which is geologically located in an area with active faults, and lithologically, rocks tend to be soft, so the impact of shaking tends to be high (Said et al., 2023). In addition, the topography of Sulawesi Barat varies from flat and hilly to mountainous Sulawesi Barat, and current climate change conditions have caused exposure to hydrometeorological disasters such as floods and landslides.

Majene Regency is the regency with the highest level of disaster risk in Sulawesi Barat Province;. However, the disaster risk index in Majene district has decreased over the last eight years; as shown in Figure 1, the value tends to be higher than other regions in Indonesia, even though Majene district occupies the eighth position as the region with the highest disaster risk in Indonesia (BNPB, 2024). This shows that the Majene Regency has a high exposure to hazards and vulnerability, with the coping capacity to disaster being relatively low. During the last 5 years, there have been several disasters that have occurred in Majene Regency. The biggest one was an earthquake in 2021, which caused IDR 4498 billion of damage and loss consisting of IDR 365.3 billion in damage and loss in the housing sector, IDR 76.9 billion in the social sector, IDR 5.13 billion in the economic sector, IDR 2.1 billion in cross-sectoral, and IDR 265 million in infrastructure. The shock has damaged 4,132 housing units, 32 economic and office facilities, 17 health facilities, and 1 unit of military office.

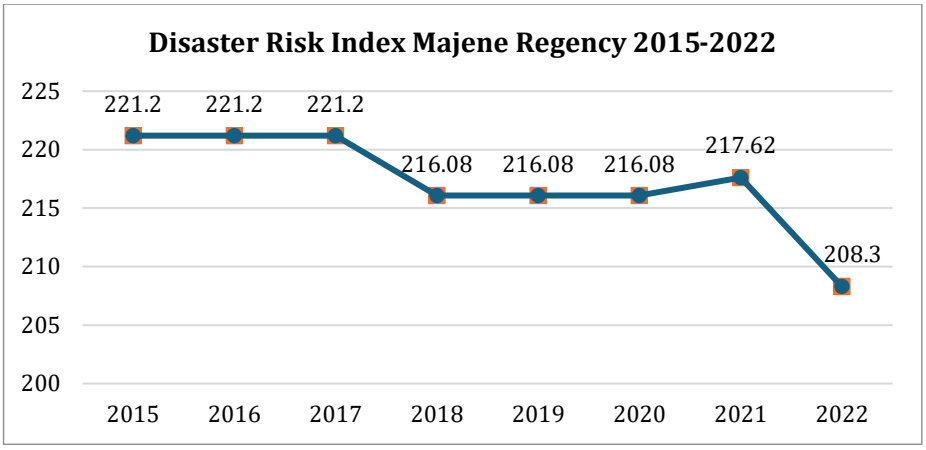

Fig. 1. Development of the Disaster Risk Index Majene Regency

The condition of Majene Regency, which has a high level of disaster risk, means that various sectors that support people's lives in the area also have the potential to be affected if disaster occurs, including the tourism sector. The potential of the tourism sector in Majene Regency is diverse, including various tourism potentials (natural, cultural, environmental) which are utilized optimally and can become an essential economic resource in efforts to accelerate economic development in Majene Regency as a whole (Suriadi et al., 2022). Natural tourism tends to be exposed to disaster risk (C.-H. Tsai et al., 2016) due to the physical and environmental characteristics of the areas where tourism has developed. In Majene, natural tourism mainly developed in the coastal area due to its geographic location, which elongated and directly bordered the Makassar Strait and is supported by its topographic conditions, which are quite diverse with varying slopes. Almost all of the tourism locations in Majene Regency are located in areas with medium to high exposure to disaster hazards (Priadmodjo et al., 2023)

The number of disasters affecting the tourism sector tends to increase (Faulkner, 2001) and its consequence on the economic sector . However, the readiness of the tourism sector to face disasters still tends to be low (Prideaux, 2003) which results the big loss in tourism industry especially in Infonesia such as the 2018 Lombok earthquake tragedy adversely affected the tourism sector (Habibi et al., 2022), leading to the fatalities of 4,636 tourists, a decline of 100,000 visitors, and financial damages to the industry amounting to 1.4 trillion (Wahyuningtyas et al., 2019). Therefore, disaster risk management has a critical position in the implementation of tourism businesses (Rindrasih et al., 2024; Hystad & Keller, 2006) as one of the steps to realizing a sustainable tourism sector (Lynham et al., 2017; Tsai & Chen, 2010). For the case of Majene Regency, disaster management is very crucial to be prioritized in development program planning including in tourism sector since based on the experience of 2021 eartquake management, the disaster mitigation aspect is still minimal (Mawan, 2021). Considering the importance of integrating disaster risk management into tourism management and development, and the existing condition of Majene Regency with high risk of disaster, while the prioritize of disaster management aspects in decision and policy making is still limited, this research aims to formulate a strategy for the planning and development of disaster-resilient tourism in Majene Regency. The result can be utilized as input and fundamental for stakeholder in Majene Regency for formulating strategies, making decision and determining policies regarding improvement of tourism sector resilient to disaster.

2. Literature Review

2.1. Disaster Resilience in Tourism: Critique existing frameworks.

Disaster resilience in Indonesian tourism is a significant issue due to the nation's vulnerability to natural hazards, including earthquakes, tsunamis, and volcanic eruptions. Numerous frameworks have been established to strengthen the resilience of the tourism sector; however, critiques of these frameworks indicate several areas requiring enhancement.

1. Fragmentation and Absence of Integration
   Current frameworks frequently exhibit insufficient integration among various phases of disaster management. Disaster management for tourism destination should covers four phase:

pre-disaster, disaster, post-disaster, and future perspectives—to enhance the management of tourism-related disasters (Fathani et al., 2023)

2. Institutional deficiencies and policy shortcomings
   The lack of comprehensive regulations and supporting documents impedes the implementation of disaster-resilient tourism policies. This deficiency results in stakeholder hesitancy and passive community engagement. Public perceptions of Indonesia's disaster management authorities indicate problems with communication, coordination, and community engagement, highlighting the necessity for institutional reform ((Ahmad et al., 2024); Risfandini et al., 2024; Tanesab, 2020).
3. Restricted Community Involvement and Utilisation of Social Capital
   Social capital plays a crucial role in community-based disaster response and recovery. Current frameworks frequently neglect the significance of bonding, bridging, and linking social capital, which are essential for effective disaster resilience (Praptika et al., 2024; Partelow, 2021; Guo et al., 2018)
4. Insufficient Readiness in Tourism Enterprises
   Numerous organisations focused on disaster preparedness have primarily adopted fundamental measures, including standard operating procedures and evacuation routes. Comprehensive preparedness strategies necessitate coordinated efforts among businesses, government, and the community (Rumambi & Sari, 2023).
5. Inadequate Incorporation of Local Knowledge and Cultural Context
   Integrating local knowledge and cultural practices into disaster resilience frameworks can improve community cohesion and sustainability. The proposed Tourism Community Resilience Model incorporates elements such as local wisdom foundations and government contributions, highlighting the necessity for culturally sensitive approaches (Sakir et al., 2024; Rumambi & Sari, 2023)

2.2. Applications in Formulating Strategies for Disaster Resilient Priority in Tourism Development

Effective and strong policies and planning is necessary in creating disaster resilient tourism sector. Thus, the combination of comprehensive, research-driven comprehension of policymaking concerning disaster risk reduction initiatives, and a substantial enhancement of capability for disaster risk reduction communication and advocacy is very crucial (Olson et al., 2020). In this context, the Analytic Hierarchy Process (AHP) has emerged as a valuable tool in formulating strategies and setting prioritize for tourism development and planning. Nevertheless, previous studies identified other deficiencies in utilization of AHP especially in setting priorities for disaster resilient tourism that necessitate additional research.

Three recent studies have been successfully employ AHP and similar methodologies in formulating public policy regarding disaster management in tourist destination. Previous research by Rindrasih et al. (2024) has successfully determine disaster risk reduction strategies in the tourist area with study case in Borobudur-Yogyakarta-Prambanan (BYP) area. This study utilize combination between SWOT and AHP method to formulate the strategies of disaster risk reduction strategies for this tourist area. SWOT analysis was used to identify various strategy options based on Integrated Tourism Master Plan (ITMP) of BYP tourist area and AHP was used to analyze the prioritization between those strategy that are likely to be implemented further. Furthermore, AHP also been used to analyze more specific strategy for disaster management in tourist destination. Two recent research regarding with this issue conducted by Kausar et al. (2023) and Zhang et al. (2023). Research conducted by Kausar et al. (2023) focused on strategy formulation of collaboration between public private partnership in tourism disaster management planning. Strategy options were identified by interview and FGD with relevant stakeholder, then AHP were used to analyze the prioritization between those strategies. While, Zhang et al. (2023) more focus on strategy formulation of emergency operation during disaster using Wenchuan earthquake in China as case study through the application of the Fuzzy Delphi Method and Analytic Hierarchy Process (AHP). The finding emphasize prevention, succeeded by preparedness, response, and recovery. The foremost five indications encompass emergency

preparedness via regional planning, management systems, early notice, education, training, and drills.

Those previous studies have been successfully resolves the gap regarding focus of DRR-related studies which usually more emphasize on residents as research target rather than tourism-specific target. Nevertheless, there are research gap that still need to be resolved. Previous studies showed that formulation of strategy for comprehensive disaster resilient tourism is still limited, as research by Kausar et al. (2023) and Zhang et al. (2023) emphasize on specific aspect of disaster management in tourism. While, Rindrasih et al. (2024) has been successfully formulate more comprehensive strategy, but more focused on specific strategic options that can be implemented in predetermined tourism areas. Therefore, to resolve these research gaps, this research aimed to formulate comprehensive strategy in creating disaster resilient tourism using more general strategy options based on disaster-resilient tourism framework by World Bank (2020) with Majene Regency as case study area.

3. Method

3.1. Approach and Research Design

The research was conducted in Majene Regency, Sulawesi Barat which selected as the research area because its highest disaster risk index in Sulawesi Barat. This research is a kind of quantitative research that in solving its research problems uses the post-positivism paradigm in developing science and uses research strategies related to numerical data (Emzir, 2019). In accordance with the characteristics of quantitative research in general, this research uses variables and data expressed in numerical units whose various processing from collection to presentation of the results also uses numbers (Mertler, 2021; Arikunto, 2006). Figure 2 depicts the research steps, commencing with a literature review which include development of research instruments, specifically the AHP questionnaire, succeeded by primary data collection through expert interviews, data processing utilizing the AHP method via Expert Choice software, and subsequent data analysis and interpretation to ascertain the ranking of strategies.

Fig. 2. Research steps

3.2. Data collection

Data used in this research is mainly primary data which collected through questionnaire. The questionnaire was developed based on variable of strategy of developing disaster-resilient tourism in Majene Regency, Sulawesi Barat. Formulation of a strategy for the development of disaster-resilient tourism based on the disaster-resilient tourism framework formulated by the World Bank (2020). This strategy consists of some policy and program which further became criteria and sub criteria in data analysis. These program and policy can be shown in table 1.

Table 1 - Policy and Programs Regarding Strategy for Development of Disaster-Resilient Tourism

No.	Policy (Criteria)	Program (Sub-criteria)
1.	Understanding risk	Integrate tourism into national climate and disaster risk assessments.
		Assess physical and financial risks from disasters and climate change to destinations and industries.
2.	Planning and prioritization	As a core competitiveness strategy, disaster and climate risk considerations should be integrated into tourism policy and investment planning.
		Embed tourism in national and local disaster management planning.
		Instilling a tourism concept that preserves the environment
		Implement business continuity and disaster planning for destinations and industries.
3.	Mitigation and Preparedness	Implement an early warning and communication system tailored to tourism.
		Promote climate and disaster-resilient tourism assets and infrastructure, including nature-based solutions.
		Establish pre-arranged mechanisms for coordinated physical and financial response.
4.	Response and recovery	Mitigate reputation risks through communications and marketing strategies.

No.	Policy (Criteria)	Program (Sub-criteria)
		Protect and restore assets, jobs, and tourism businesses through stimulus packages.
		Enabling technological support for the recovery of tourism infrastructure and assets
		Provide targeted support programs for vulnerable groups, including women-owned businesses, self-employed or informal workers, and SMEs
5.	Long-term resilience actions	Reduce climate impact
		Implementing low-carbon tourism
		Implementing energy efficiency in the tourism industry

Source: World Bank, 2020

Primary data were collected from 12 selected experts identified as stakeholders through the use of pairwise questionnaires. The selection of experts was conducted purposefully, guided by specific criteria including their capacity, knowledge of the area, and the role each individual plays within the tourism industry in Majene. A diverse range of stakeholders was interviewed to guarantee representation across all categories, specifically: government, community, private sector, and academics which the profiles can be described in table 2.

Table 2 - Stakeholder profile

No.	Expert Groups	Role	Area of expertise
1.	Government	Representative of tourism board in Majene Regency (1 people)	Facilitating tourism development in Majene Regency
		Representative of disaster board in Majene Regency (1 people)	Facilitating disaster management in Majene Regency
		Representative of regional planning and development board in Majene Regency (1 people)	Facilitating all aspect of regional planning and development affair in Majene Regency
2.	Academics	Representative of research and community service institute in the university (1 people)	Academics retain connections with national and environmental institutions that oversee disaster reduction efforts (Coppola, 2015)
		Lecturer in urban and regional planning (2 people)	
3.	Hospitality industry	Representative of hotel management in Majene Regency (2 people)	Actors who run and involved in the hospitality sector
		Representative of small and medium enterprise around tourist destination (2 people)	
4.	Community	Representative of Tourism Awareness Group (2 people)	Local community who involved in management of tourist destination

Source: Authors, 2024

The questionnaire for data collection uses a measurement scale from 1 to 9 (Saaty, 2004), which can be described in table 3.

Table 3 - The measurement scale for AHP

Scale	Remarks
1	Both elements are equally important
3	One element is slightly more important than other elements
5	One element is more important than the others
7	One element is clearly more important than the others
9	One element is more important than the others
2, 4, 6, 8	Values between two adjacent scales

Source: Saaty, 2004

3.3. Data Analysis

Since the outcome of this research can be used to support decision-making, this research uses a decision-support system (Turban et al., 2004). A decision support system uses data, provides an easy user interface, and can incorporate decision-makers' thinking. The obtained data were analyzed using the Analytical Hierarchy Process (AHP) method. AHP is a method in a decision-making system that uses several variables with a multilevel analysis process. Analysis is carried out by giving each variable a priority value, then pairwise comparisons of existing variables and alternative alternatives (Saaty, 1984). AHP was selected over other decision support system method such as TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) because it was effectively addresses the hierarchical intricacies of criteria and ensures greater

consistency in outcomes (Rahman, 2024; Ccatamayo-Barrios et al., 2023). In this research, implementation of AHP based on the hierarchy of goals, criteria, and sub-criteria where criteria represent policy, and sub-criteria represent the programs to build disaster-resilient tourism, which already described in table 1.

After obtaining assessment data for each criterion from respondents, the next stage is a pairwise comparison calculation (Mulawarman, 2017). The standardized 1–9 comparison scale was employed to conduct multiple pairwise comparisons within the AHP model. This research employs Expert Choice (Nasibu I..Z, 2009) as a decision support system (DSS) software, which facilitates the evaluation of multiple decision criteria through the AHP method. The pairwise comparison here means that if an element X is compared with itself, it produces a value of 1; if element X is compared with element Y, it will produce a certain value, $\frac{x}{y}$, and if element Y is compared with element X, then the resulting value is the opposite of that value $\frac{y}{x}$ (Suryadi & Ramdhani, 2000). Then, X which defined as a set of criteria, represented as X = {Xj|j = 1, 2, …n}. The pairwise comparison of "n" can be encapsulated in a (n x n) evaluation matrix "A," where each element ij (i, j = 1, 2, …n) represents the quotient of the weights assigned to the criteria.

$$A = (a_{ij})_{nxn} = \begin{bmatrix} a_{11} & a_{12} \dots & a_{1n} \\ a_{21} & a_{22} \dots & a_{2n} \\ \vdots & \vdots & \vdots \\ a_{n1} & a_{n2} \dots & a_{nn} \end{bmatrix}$$

Following this, the matrix underwent normalization, and the relative weights were established. The relative weight is derived from the right eigenvector (w) associated with the largest eigenvalue (λ max), as represented by the equation $A_w = \lambda_{max}. W$.

4. Result and Discussion

4.1. Determination of priority disaster resilient tourism development strategy

Determination of priority criteria to formulize priority strategy was done by analyzing the data collected from each expert. The method used for this analysis is the Analytical Hierarchy Process (AHP), which is processed using Expert Choice Software. The first step taken in this analysis is the preparation of a hierarchy, which will become the basis for data analysis. Hierarchies are arranged to make it easier to understand a complex system so that solutions to the problem can be formulated. In this case, the preparation of a hierarchy related to disaster-resilient tourism development strategies aims to determine priority strategies along with priority programs for each strategy so that later, it is hoped that the results can become the basis for determining policies related to disaster-resilient tourism development in Majene Regency. The hierarchy developed based on the disaster-resilient tourism framework formulated by the World Bank (2020) and can be presented in the following figure.

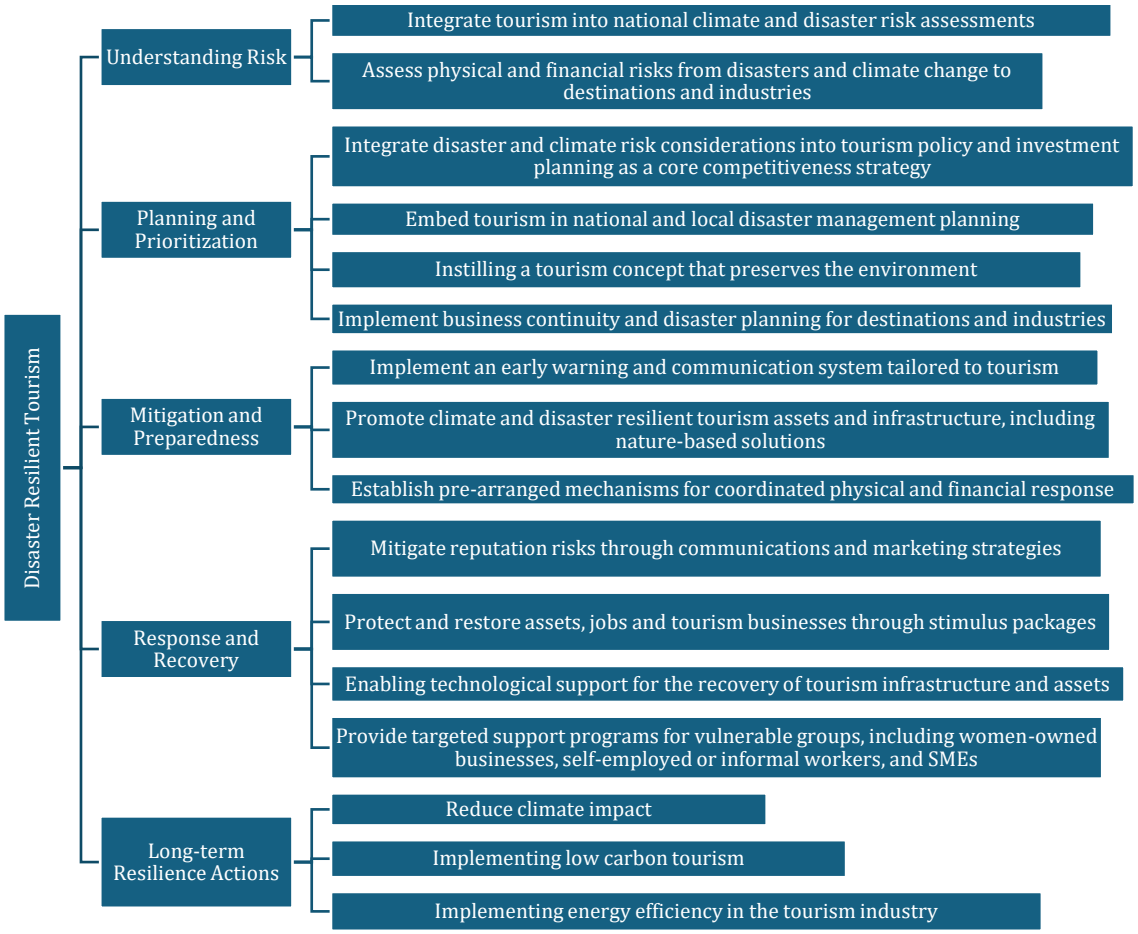

Fig. 3. Hierarchy for disaster resilient tourism development strategies

Determining priority strategies uses the results of questionnaires distributed to experts in the field of tourism development consisting of academics and tourism actors represented by a tourism awareness group, the government tourism office, the regional disaster management agency, and the regional development planning agency of Majene Regency. The results of a combination of pairwise comparisons of disaster-resilient tourism development strategies from the five experts can be presented in the following figure.

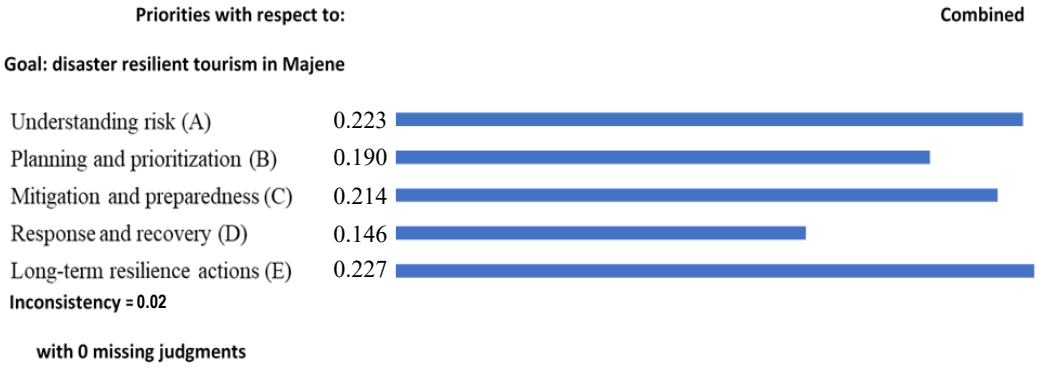

Fig. 4. Analysis result of Priorities for disaster resilient tourism development strategies

Based on the combined AHP results for disaster-resilient tourism above, it can be seen that the inconsistency weight value in the combined criteria for disaster-resilient tourism is 0.02 because this value is smaller than the maximum inconsistency value limit; therefore, the AHP model is consistent and can be used to determine the priority strategy of disaster resilient tourism. Based on the AHP model, the priority strategy for developing disaster-resilient tourism is long-term resilience actions, which have a weight of 22.7%. This is followed by the strategy of understanding risk, which has a weight of 22.3%. These two strategies are related because long-

term resilience action strategies can be realized when a basic understanding of risk in the tourism area is achieved. The other strategy, which is also important, is mitigation and preparedness, which weighs 21.4% and becomes the third strategy that should be prioritized. This strategy is essential because in order to create resilience to disaster, mitigation and preparedness for disaster should be improved.

4.2. Determination of priority program for each strategy

4.2.1. Priority program for strategy: Understanding risk

Disaster risk is the likelihood of loss of life, injury, or destruction and damage from a disaster in a given period (UNDRR, 2015). Disaster risk is also recognized as the result of the interaction between a hazard and the characteristics that make people and places vulnerable and exposed; in this interaction, some characteristics make people and places have coping capacities in order to reduce wider impact and more significant loss. Understanding risk is an important step in reducing the impact of disasters in various sectors, including tourism. This strategy consists of two programs: 1) integrate tourism into national climate and disaster risk assessments (A1) and 2) assess physical and financial risks from disasters and climate change to destinations and industries (A2). The result of the pairwise comparison between experts, which was processed using the AHP technique, can be shown in the following figure.

Fig. 5. Analysis result of priority program for strategy: Understanding risk

Undertanding risk consists of two programs; therefore, pairwise comparison covers these two programs. Based on the result of the AHP process using Expert Choice software, as shown in Figure 5, a program for integrating tourism into climate and disaster risk assessments (weight: 56.7%) has a higher value than the program for assessing physical and financial risks from disasters and climate change to destinations and industries (weight: 43.3%). Therefore, the priority program for this criterion is to integrate tourism into national climate and disaster risk assessments.

4.2.2. Priority program for strategy: planning and prioritization

Strategy planning and prioritization in the tourism resilience framework means planning and prioritizing tourism development and investments to build resilience and avoid or minimize negative impacts at the destination and firm levels (World Bank, 2020). This strategy consists of four programs: 1.) integrate disaster and climate risk considerations into tourism policy and investment planning as a core competitiveness strategy (B1), 2) embed tourism in national and local disaster management planning (B2), 3) instill a tourism concept that preserves the environment (B3), and 4) implement business continuity and disaster planning for destinations and industries (B4). The following figure shows the results of the AHP analysis of programs in this strategy.

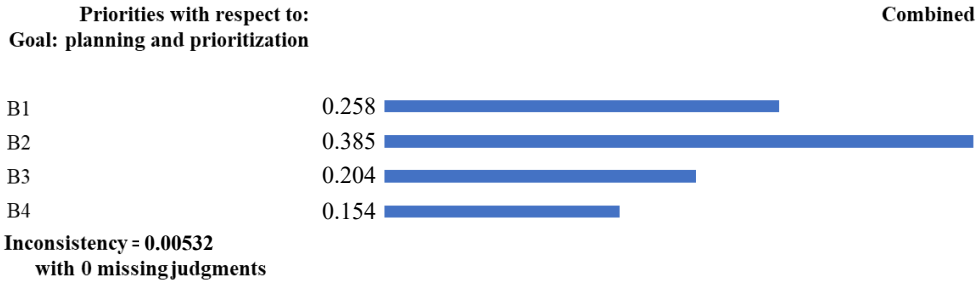

Fig. 6. Analysis result of priority program for strategy: planning and prioritization

Based on analysis results as shown in Figure 6, a program that has the highest priority is embedding tourism in national and local disaster management planning with a weight value of 38.5%. This program is essential because Indonesia already has a national and regional disaster management agency. It should be included in program planning as a basis for implementing disaster risk reduction programs, especially in the tourism sector. This is crucial considering that Majene Regency has a lot of tourism potential, including natural tourism and cultural tourism potential, which covers the old city area.

4.2.3. Priority program for strategy: mitigation and preparedness

Mitigation and preparedness strategy means that in order to achieve disaster resilient in the tourism sector, the strategy should also take any effort to lessen or minimize the adverse impacts of disaster into action, including an effort to improve the preparedness of tourism in facing disaster with some activities such as the development of contingency planning, the stockpiling of equipment and supplies, the development of arrangements for coordination, evacuation and public information, and associated training and field exercises. Mitigation and preparedness strategy consists of three programs: 1) implement an early warning and communication system tailored to tourism (C1), 2) promote climate and disaster-resilient tourism assets and infrastructure, including nature-based solutions (C2), and 3) establish pre-arranged mechanisms for coordinated physical and financial response (C3). The following figure shows the result analysis of the priority program for strategy: mitigation and preparedness.

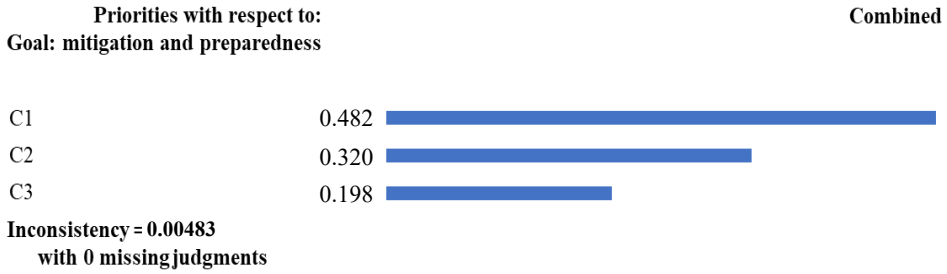

Fig. 7. Analysis result of priority program for strategy: Mitigation and preparedness

Based on the result analysis of the AHP process using Expert Choice software shown in Figure 7, the priority program for mitigation and preparedness is to implement an early warning and communication system tailored to tourism with a weight value of 48.2%. An early warning system is very important to improve preparedness for disasters, and a good communication system is very important to ease the process of evacuation and emergency response when disaster strikes. This program is crucial in developing resilient tourism in the Majene Regency, considering that most locations are not equipped with proper early warning systems.

4.2.4. Priority program for strategy: Response and recovery

Response and recovery strategy in developing disaster-resilient tourism covers any effort to support taking good response decisions and actions during and after disaster events to minimize disruptions and losses and, as a result, maintain and enhance competitiveness. This should be considering the effectiveness and efficiency of decisions and actions. During emergency response, effective and efficient actions can save more lives. Response and recovery strategy consists of four programs: 1) mitigate reputation risks through communications and marketing strategies (D1), 2) protect and restore assets, jobs, and tourism businesses through stimulus packages (D2), 3) enable technological support for the recovery of tourism infrastructure and assets (D3), and 4) provide targeted support programs for vulnerable groups, including women-owned businesses, self-employed or informal workers, and SMEs (D4). Result analysis of the priority program for strategy: response and recovery can be shown in Figure 8.

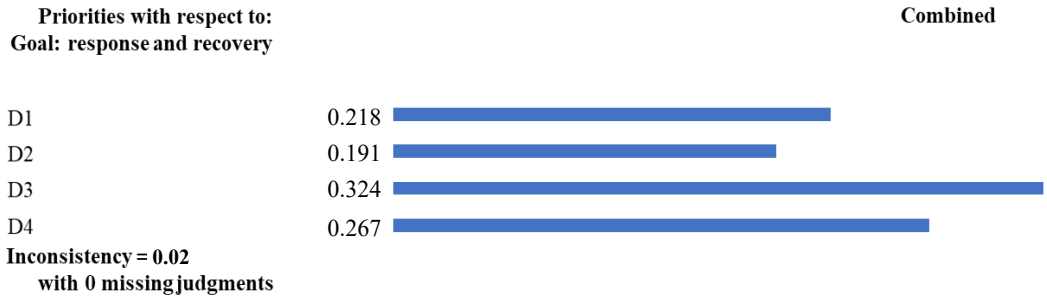

Fig. 8. Analysis result of priority Program for strategy: Response and recovery

The program that has the highest priority for response and recovery strategy is enabling technological support for the recovery of tourism infrastructure and assets with a weight value of 32.4%. Another important program is providing targeted support programs for vulnerable groups, including women-owned businesses, self-employed or informal workers, and SMEs, with a weight value of 26.7%. This is very suitable to be implemented in Majene Regency, considering that many SMEs run their business in tourist locations.

4.2.5. Priority program for strategy: long-term resilience actions

A long-term resilience actions strategy is a strategy that has the highest priority, according to the results of the data analysis. This strategy aims to achieve the planning for the sector's long-term sustainability through climate change mitigation actions. In the context of the development of disaster-resilient tourism in Majene Regency, this is very important because many programs are still focused on short-term goals and lack long-term sustainability. Long-term resilience actions consist of three programs: 1) reduce climate impact (E1), 2) implement low-carbon tourism (E2), and 3) implement energy efficiency in the tourism industry (E3). The result analysis for the priority program in this strategy can be presented in the following figure.

Fig. 9. Analysis result of priority program for strategy: long-term resilience actions

Based on the data analysis, two programs have high priority in long-term resilience strategy: reducing climate impact with a weight value of 39.7% and implementing low carbon tourism with a weight value of 37.9%. These two programs have weight value with small differences; therefore. to create long-term resilience to disaster in the tourism sector, the local government should consider implementing these two programs.

4.3. Discussion

The Analytical Hierarchy Process (AHP) results highlight long-term resilience actions as the top priority for developing disaster-resilient tourism in Majene Regency. This aligns with the World Bank (2020) framework, which places long-term planning and climate change mitigation at the core of resilient tourism development. Previous studies, such as Becken & Hay (2007), emphasize the necessity of incorporating sustainability and resilience into tourism to address future climate variability and disaster threats effectively.

The second highest priority, understanding risk, further confirms existing literature emphasizing the foundational role of comprehensive risk assessments. According to (UNDRR (2015), understanding disaster risk involves analyzing hazards, vulnerabilities, and coping capacities—crucial steps in formulating any risk reduction strategy. Scott et al. (2012) argue that inadequate risk awareness among tourism stakeholders often hinders proactive planning, making this strategy highly relevant.

The AHP results also identify "integrating tourism into national climate and disaster risk assessments" as the highest priority program under the understanding risk strategy. This supports Bhati et al. (2016) and Becken et al. (2014) who called for tourism planning should include adaptation plans and disaster risk frameworks, recognizing the sector's vulnerability and economic importance.

The planning and prioritization strategy received significant attention, with the most favored program being to embed tourism in national and local disaster management planning. This aligns with Ritchie (2009), who argued that crisis and disaster management in tourism must not be isolated but rather integrated with broader regional and national risk reduction systems.

In the mitigation and preparedness category, "implementing an early warning and communication system tailored to tourism" emerged as the top priority. Research by Faulkner (2001) and Hystad & Keller (2008) supports this, noting that early warning systems and tailored communication improve preparedness and can substantially reduce the impact of disasters on tourists and operators.

Under the response and recovery strategy, technological support for infrastructure recovery was most emphasized. Biggs et al., (2012) and Calgaro et al. (2014) note that integrating technological innovation, such as GIS mapping and mobile communication, accelerates recovery, improves decision-making, and builds long-term resilience in tourism sectors affected by disaster.

Finally, the strategy with the highest weight—long-term resilience actions—includes reducing climate impact and implementing low-carbon tourism as top programs. These align with Hall & Gössling (2006), who highlight that tourism is both a contributor to and a victim of climate change, necessitating strategies such as low-carbon travel and energy-efficient infrastructure to ensure sustainability.

Together, these findings confirm and reinforce earlier research, emphasizing the critical need for integrating climate resilience, risk understanding, and sustainability into tourism development planning—especially in vulnerable and tourism-rich regions like Majene Regency.

5. Conclusion

This research utilized the Analytical Hierarchy Process (AHP) to ascertain and rank priority initiatives for fostering disaster-resilient tourism in Majene Regency, a region in Indonesia highly susceptible to disasters. The findings indicated that the foremost priority strategy is long-term resilience initiatives, closely followed by risk comprehension, mitigation, and preparedness. These findings underscore the imperative for innovative strategies, thorough risk evaluations, and anticipatory catastrophe preparedness to guarantee tourism resilience in high-risk regions.

The emphasis on long-term measures like climate impact mitigation and low-carbon tourism indicates a transition from reactive to proactive policy planning. This accords with global frameworks such as the World Bank's Resilient Tourism Model and solves deficiencies identified in previous research where short-term recovery frequently eclipsed sustainable development initiatives. Furthermore, incorporating tourism into national disaster risk assessments and integrating it into local management plans underscores the increasing recognition of tourism's significance in regional vulnerability and resilience enhancement.

This study offers an evidence-based framework for local governments, tourist stakeholders, and planners to develop effective strategies. When well executed, these techniques can reduce losses during disasters and expedite recovery, thereby preserving the economic and social advantages of tourism in disaster-prone areas. The extensive application of AHP in evaluating complicated, multi-criteria decisions allows for its adaptation in different locations with analogous issues.

Future study ought to investigate stakeholder-specific readiness, oversee the execution of prioritized methods, and contemplate the incorporation of qualitative evaluations to enhance comprehension of local talents and limitations. This study considerably advances the subject of disaster risk reduction in tourism by providing a reproducible strategy framework based on stakeholder-driven priorities, despite constraints related to expert selection scope and contextual specificity.

Ultimately, establishing a disaster-resilient tourism business in Majene necessitates a collaborative, long-term, and scientifically-informed strategy that harmonizes economic potential with environmental and human security. The findings from this research can inform regional development planning, catastrophe mitigation investments, and sustainable tourism policy reform, applicable not only in Majene but also in other comparable high-risk locations.

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