World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

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Participation of local community in the implementation of rural empowerment-based peatland conservation program on economic revitalization in South Sumatra, Indonesia

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World Journal of Advanced Research and Reviews, 2026, 30(01), 2220-2228

Publication history: Received on 15 March 2026; revised on 22 April 2026; accepted on 24 April 2026

Article DOI: https://doi.org/10.30574/wjarr.2026.30.1.1000

Abstract

Peatland is critical ecosystems for carbon storage and biodiversity. However, it is highly vulnerable to degradation from unsustainable land use. Therefore, the participation of local community is required for peatland conservation. This study aims to analyze the level of community participation and the relationship between the internal factors such as knowledge, willingness, ability, and opportunity and local community's participation in the rural empowerment based peatland conservation program in Banyuasin Regency, South Sumatra Province, Indonesia. A survey method was employed using purposive sampling with respondents consisting of local community involved in the program across in three villages. Data were analyzed using scoring by Likert scale analysis to measure the participation of local community and Spearman Rank correlation to examine relationships between the internal factors and local community's participation The results showed that community participation is in the high category across all stages, including planning, implementation, benefit utilization, and evaluation. Internal factors such as knowledge, willingness, and ability are also categorized as high. Meanwhile, opportunity remains at a moderate level. Correlation analysis revealed that all internal factors have a positive, very strong, and significant relationship with the participation. Furthermore, the community ability was identified as the most significant factor. These findings indicated that strengthening community capacity supported by adequate knowledge and willingness is essential to enhance the participation of local community. However, improving external support, particularly government policies and market access, is necessary to ensure the long-term sustainability of the program.

Keywords: Community participation; Capacity building; Peatland management; Rural empowerment; Sustainable development

1. Introduction

Indonesia's peatland ecosystems play a crucial role in global climate regulation as they store massive amounts of carbon, estimated between 13.6–57 GtC, representing a significant share of the world's tropical peat carbon stock, while also serving as important habitats for biodiversity [1][2][3][4]. However, the fragile nature of peatland create damage difficult to reverse, while degradation continues to increase due to activities such as drainage and inappropriate commodity selection [5]. Dry peat conditions increase the risk of forest and land fires and carbon emissions, while land subsidence has the potential to cause flooding.

South Sumatra Province has 34 Peatland Hydrological Regions (KHG) with an area of about 2.09 million ha, most of which have experienced various levels of damage, ranging from mild to very severe. The main problem in peat utilization is the issue of CO_2 emissions that have a global impact, thus encouraging government policies such as the peatland

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moratorium through Presidential Instruction No. 10 of 2011 [6]. In addition, the limitations of land characteristics cause the use of peat to be suitable only for certain commodities, such as horticulture and annual crops, while paddy fields are limited to shallow peat.

Peatland damage is also triggered by low community understanding and capacity in peatland management, which is characterized by the rampant artificial drainage, loss of vegetation, and increasing land fires [7]. On the other hand, the community should take role in peat management because of the social, economic, and cultural proximity to the ecosystem, but low knowledge and participation are still the main challenges. Therefore, livelihood revitalization based on sustainable utilization is one of the solutions to improve welfare while maintaining peat ecosystems [8].

The government has initiated the Rural Empowerment Based Peatland Conservation Program (DMPG) which focuses on rewetting, revegetation, and improving community welfare through empowerment and institutional strengthening [9]. This program aims to encourage village independence through the development of local potential. However, the implementation is not optimal because community participation, especially local communities, is still low. Therefore, this study aims to analyze the level of knowledge, ability, willingness, opportunity, and community participation, as well as examine the influence of these internal factors on the level of community participation in the DMPG program, especially in priority areas such as Banyuasin Regency in South Sumatra Province which has a high level of urgency of peat damage [10].

2. Material and methods

2.1. Place and Time of Research

This research was conducted in Muara Padang District, Banyuasin Regency, South Sumatra Province. The research was conducted in three villages, namely Sido Mulyo 20 Village, Air Gading Village, and Tirto Raharjo Village. The three locations are targets for the implementation of the DMPG Program organized by the Ministry of Environment and Forestry (MoEF) considering several aspects, including peat ecosystem function maps, damage criteria and status, the latest fire area maps, village administration maps, and village socio-cultural maps. The research time was carried out in November 2024 – March 2025.

2.2. Research Methods

The method used in this study was survey method using the structured and systematic questions to many people, and then all the data obtained were recorded, processed, and analyzed [11]. This method is possible to obtain information on topics to be observed related to community participation and the formulation of a sustainability strategy for the rural empowerment-based peatland conservation program in Muara Padang District, Banyuasin Regency, South Sumatra Province.

2.3. Sampling Methods

The sampling methods carried out in this study was the purposive sampling method, where the researcher determines the sampling intentionally by setting special criteria that are in accordance with the research objectives. It is expected to answer the research problem.

Some considerations in determining the expert who is a respondent are: (a) having competent experience in accordance with the field being studied; (b) have a reputation, position/position in their competence with the field being studied; and (c) have high credibility, willing, and/or be in the location being studied (Marimin, 2004). Respondents in the sustainability research of the revitalization-based DMPG program in Banyuasin Regency, South Sumatra Province are the Peatland Ecosystem Conservation and Management Working Team (TK-PPEG) and companions or Community Facilitators (FM). The number of indicators in this study is 20 so that the minimum sample number in this study is 31 respondents, which will be taken from the community implementing the DMPG program in three villages in Muara Padang District in a purposive manner.

2.4. Data Collection Methods

The data collected in this study consists of two types; namely primary data and secondary data related to the research plan. Primary data is a data source that directly provides data to researchers through observation and direct interviews with related parties using questionnaires to measure variables [11].

Secondary data in this study was obtained through the Directorate of Peat Ecosystem Damage Control, the Directorate General of Environmental Control, Pollution and Damage, the Ministry of Environment and Forestry (KLHK) and other related agencies in the form of guidelines, reports and documents, as well as literature such as books, scientific journals, and reports relevant to this research.

2.5. Data Processing Methods

2.5.1. Likert Scale Analysis

The measurement of variable indicators in this study used a likert scale which aims to show the degree of strength (agree or disagree) on a statement. The likert scale generally consists of five rating numbers, namely: (1) to strongly disagree, (2) to disagree, (3) to be neutral, (4) to agree, and (5) to strongly agree. The value intervals used are as follows:

Table 1 Interval Value Indicator on the Likert Scale

Number	Interval	Category
1	4.3<x<5	Very High
2	3.5<x<4.2	High
3	2.7<x<3.4	Medium
4	1.9<x<2.6	Low
5	1<x<1.8	Very Low

The variables analyzed in this study were adopted from the DMPG Program Implementation Guidelines document issued by the Ministry of Environment and Forestry of the Republic of Indonesia, which consists of Knowledge, Willingness, Ability, opportunities and community participation [12]. The description of each indicator is as follows:

Community Knowledge

The indicators of community knowledge are observed through the 3R approach (Rewetting, Revegetation, and Revitalization) in accordance with the DMPG work program that has been implemented by the Directorate General of PPKL-KLHK RI with the principle of restoring water and vegetation to peat ecosystems in community areas and improving the lives of their communities (social, cultural, and economic).

Community Will

Indicators of people's willingness are measured through psychological and social approaches, namely interests, attitudes and motivations. These variables are approached by the Theory of Planned Behavior [13].

Community Capability

The indicators of the ability of the community to participate in the DMPG program include several important aspects, namely technical ability, social ability, and adaptive ability. Through strengthening the three indicators, it is hoped that the DMPG program can create an independent community and be able to contribute to the sustainable recovery of peat ecosystems.

Oppurtinity

Indicators of community opportunity to participate in the DMPG program include several important aspects, namely technical ability, social ability, and adaptive ability. Through strengthening the three indicators, it is hoped that the DMPG program can create an independent community and be able to contribute to the sustainable recovery of peat ecosystems.

Participation

Participation indicators consist of four forms of participation, namely participation in decision making, participation in implementation, participation in benefits, and participation in evaluation.

Spearman Rank Correlation Analysis

Spearman rank correlation is used to analyze the relationship between community behavior which includes knowledge, willingness, and ability to the level of community participation in the implementation of the Peat Care Independent Village program. Spearman Rank Correlation is a non-parametric test used to measure the strength of the relationship between two ordinal variables or interval variables that are not normally distributed (Ghozali, 2018). Data processing is carried out using the Statistical Package for Social Science (SPSS) for Windows computer program. The formula used is as follows:

$$rs = 1 - \frac{6 \Sigma d_i^2}{n (n^2 - 1)}$$

Description :
rs = Spearman Correlation Coefficient
d_i = Difference in rank between two variables
n = Number of Data Pairs
1 = Determining significance values

The significance test was carried out by looking at the Sig. (2-tailed) value on the SPSS output result. With testing criteria:

If the Sig. < 0.05 → there is a significant relationship between the two variables.

If the Sig. ≥ 0.05 → there is no significant relationship.

Table 2 Interpretation Value of Correlation Value

No.	Correlation value	Power of Correlation
1.	0.00–0.199	Very weak
2.	0.20–0.399	Weak
3.	0.40–0.599	Medium
4.	0.60–0.799	Strong
5.	0.80–1.000	Very Powerful

3. Results and discussion

The DMPG program is a framework to harmonize various development programs in peat villages, especially around restoration areas. The establishment of peatland rural areas serves as a starting point in the community's peat area management plan. The basic principle used in the restoration of peat ecosystems is to restore water and vegetation, as well as improve the lives of their communities (social, cultural, and economic) or in other words "Rewetting, Revegetation, and Improve local community livelihood" [13]. Economic improvement activities are intended to be able to improve the livelihood of the community so that they have the strength and independence to actively participate in the protection and management of Peat Ecosystems. The proposed economic improvement activities are economic improvement activities that are friendly to the Peat Ecosystem.

The implementation of the DMPG program involves various parties, one of which is universities. Higher education through the Tri Dharma of Higher Education has a very important role in supporting the implementation of peat ecosystem protection and management policies, especially in the DMPG program. Sriwijaya University is a university that is a partner of the Ministry of Environment of the Republic of Indonesia in the implementation of the DMPG Program in South Sumatra, which plays a role in providing technical and administrative assistance to the management and supervision of Community Facilitators in villages that are the target of the implementation of the DMPG program in three villages, namely Sido Mulyo 20 Village, Air Gading Village and Tirto Raharjo Village.

3.1. Results of Measurement of Knowledge Level, Willingness, Ability, Opportunity and Level of Community Participation in the DMPG Program

3.1.1. Community Knowledge

Community knowledge indicators include rewetting, revegetation and revitalization in the implementation of the Peat Independent Care Village (DMPG) program. The results of the likert scale analysis are as follows.

Table 3 Output of Likert Variables of Community Knowledge

Indicator	Average Score	Category
Rewetting	3.87	High
Revegetation	4.13	High
Revitalization	3.98	High
Knowledge	3.99	High

Analysis of community knowledge indicators shows that public knowledge variables related to technical and ecological aspects of restoration, including rewetting (restoration of hydrological conditions), revegetation (replanting of vegetation), and economy-based revitalization are in the high category with an average score of 3.99. Community knowledge that is in the high category on all aspects of peat restoration shows that the community has a good understanding of the concept of land sustainability and the restoration process, which reflects the integration of technical and ecological knowledge in the context [14].

This is also in line with findings in global-scale ecosystem restoration research that show that high levels of community knowledge correlate with better ecological and social restoration outcomes, as local knowledge helps in decision-making, implementation of restoration activities, and adaptation to local environmental conditions. Other research has also shown that active community involvement in restoration not only enhances the understanding of ecosystem functioning, but also strengthens the relationship between ecological aspects and local economic well-being, especially when restoration programs are complemented by training, counseling, and participation in technical planning [15].

3.1.2. The Will of the Community

Indicators of community willingness include interest, attitudes and motivation in the implementation of the Peat Independent Care Village (DMPG) program. The results of the likert scale analysis are as follows.

Table 4 Likert Output Variables of Community Will

Indicator	Average Score	Category
Interest	4.02	High
Attitude	4.08	High
Motivation	4.05	High
Willing	4.05	High

The analysis of the indicators of community willingness in the implementation of the DMPG Program is in the high category (average score X2 = 4.05), which is reflected in the high interest, attitude, and motivation of the community to actively participate in program activities. These findings indicate a positive tendency of communities to engage voluntarily and sustainably in peat ecosystem management and restoration, as well as contribute to the success of the program through participation in various stages of activities. This is in line with the findings of international research showing that the value of people's positive attitudes and perceptions of the ecological value of an environmental project significantly affects their level of participation in all stages of program implementation, including planning, implementation, and monitoring (e.g. on mangrove management projects involving local communities).

In addition, the global literature also confirms that community engagement which includes willingness, motivation, and active participation is a key aspect in the success of sustainable development programs and community-based

environmental management, as community commitment and contribution can strengthen the legitimacy and sustainability opportunities of programs [16]. Therefore, the high scores of public interest, attitudes, and motivation in this study not only reflect the positive response to the DMPG program, but are also consistent with empirical evidence that strong community will is an important factor in supporting the effectiveness of community-based environmental and development programs.

3.1.3. Community Capabilities

Indicators of community capabilities include technical, social and adaptive capabilities in the implementation of the Peat Independent Care Village (DMPG) program.

Table 5 Likert Output of Community Ability Variable

Indicator	Average Score	Category
Technical Capabilities	3.89	High
Social Skills	3.76	High
Adaptive Capabilities	3.68	High
Ability	3.78	Height

The analysis of the indicators of community ability in the implementation of the DMPG Program is in the high category (average score X3 = 3.78), which reflects adequate technical and social skills and quite good adaptive abilities although relatively lower than other aspects. Technical ability (3.89) indicates that the community has the basic skills and practical knowledge necessary for the implementation of program activities, while social ability (3.76) reflects the ability of the community to interact, collaborate, and utilize social networks to support the implementation of activities collectively. Slightly lower adaptive ability (3.68) illustrates that communities still need time and experience to adapt to the dynamics of changing environments and programs, including in the face of new technical challenges and changing socio-ecological conditions.

These findings are consistent with academic studies that affirm that community capacity includes technical, social, and adaptive dimensions, where these capabilities are interrelated and important in supporting the participation and sustainability of community-based programs in socio-ecological systems. For example, adaptive capacity is an important component of socio-ecological systems that are influenced by resource availability, social organization, learning, and flexibility, all of which contribute to the ability of communities to anticipate and respond to changes in environmental and social conditions in a sustainable manner [17].

3.1.4. Opportunities

Indicators of opportunities owned by the community include government support, community facilitators and market support in the implementation of the Peat Independent Care Village (DMPG) program

Table 6 Likert Output Oppurtunity Variable

Indicator	Average Score	Category
Government Support	3.42	Medium
Community Facilitator	3.55	High
Market Support	3.31	Medium
Opportunity	3.43	Medium

The analysis of the Opportunity indicator in the implementation of the DMPG Program is in the medium category with an average value of 3.43, making it a relative weak point in supporting the sustainability of the DMPG Program. The indicators of government support (3.42) and market support (3.31) are still moderate, indicating the limitations of supporting policies, market access, and economic incentives for the community. This condition has the potential to hinder the sustainability of the program, especially in the post-intervention phase. The success of community-based resource management is largely determined by the external institutional environment, including government policies

and access to markets. On the other hand, the indicator of the role of community facilitators (3.55) is in the high category, indicating that mentoring plays an important role as a bridge between the community, the government, and the program. Effective facilitation is able to increase local capacity and maintain the sustainability of participation.

3.1.5. Community Participation

Community participation is a variable which is measured in the indicators of planning, implementation, utilization of results and evaluation in the DMPG Program.

Table 7 Likert Output of Community Participation Variables

Indicator	Average Score	Category
Planning	3.94	High
Implementation	4.07	High
Utilization of Results	4.01	High
Evaluation	3.72	High
Participation	3.94	High

The analysis of the indicators of participation in the implementation of the DMPG Program was in the high category at all stages of the program, with an average score of 3.94. The strongest participation occurred at the implementation (4.07) and outcome utilization (4.01) stages, which indicated active community involvement in real activities and direct benefits of the program. High participation at the implementation stage reflects the community's sense of ownership of the program, even though structural support is not fully optimal.

3.2. Analysis of the Relationship of Community Behavior to the Participation in the Implementation of the Peat Care Independent Village Program

Spearman rank correlation is used to test the relationship between people's behaviors which includes knowledge, ability and willingness to the level of community participation in implementing the DMPG program. The results of the spearman rank correlation analysis are as follows:

Table 8 Result Spearman rank correlation

No.		Knowledge	Willpower	Capabilities	Participation
Knowledge	Correlation Coefficient	1.000	0.876**	0.869**	0.875**
	Sig. (2-tailed)	.	0.000	0.000	0.000
	N	25	25	25	25
Willing	Correlation Coefficient	0.876**	1.000	0.849**	0.848**
	Sig. (2-tailed)	0.000	.	0.000	0.000
	N	25	25	25	25
Capabilities	Correlation Coefficient	0.869**	0.849**	1.000	0.939**
	Sig. (2-tailed)	0.000	0.000	.	0.000
	N	25	25	25	25
Participation	Correlation Coefficient	0.875**	0.848**	0.939**	1.000
	Sig. (2-tailed)	0.000	0.000	0.000	.
	N	25	25	25	25

The results of the Spearman Rank correlation test showed that all indicators, namely knowledge, willingness, ability, and community participation in the implementation of the Peat Independent Care Village (DMPG) program in South

Sumatra had a positive, very strong, and significant relationship (Sig. = 0.000 < 0.05). This indicates that an increase in one indicator is likely to be followed by an increase in another.

The Knowledge indicator has a very strong correlation with willingness (0.876), ability (0.869), and participation (0.875). This means that the higher the level of community knowledge about peat management and the DMPG program, the greater their willingness to get involved, the better their ability to carry out activities, and the higher the level of participation. This shows that knowledge is a basic factor that influences other internal aspects.

The Willingness indicator also shows a very strong relationship with ability (0.849) and participation (0.848). This indicates that the internal motivation or motivation of the community plays an important role in increasing their capacity as well as participation in the program. People who have a high will tend to be more active in learning, adapting, and contributing to DMPG activities.

In the ability indicator, the highest correlation with participation (0.939) was found compared to other relationships. This shows that people's capabilities—both in terms of technical, managerial, and experience—are the most dominant factors that determine the level of participation. In other words, even if the community has the knowledge and willingness, without adequate capabilities, participation will not be optimal.

Overall, these results confirm that the four indicators are closely related and mutually reinforcing in the context of implementing DMPG. Ability emerges as the key factor that has the most direct influence on participation, while knowledge serves as the initial foundation that drives the formation of willpower and ability. Therefore, efforts to increase community participation in the DMPG program in South Sumatra need to be focused on capacity building, counseling, and strengthening community motivation simultaneously [18].

4. Conclusion

Community participation in the DMPG program is high, supported by strong levels of knowledge, willingness, and ability. These internal factors have a very strong and significant relationship with participation, with capability as the most influential factor. However, external support—especially government and market access—remains moderate and may limit long-term sustainability. Efforts should focus on strengthening community capacity through training and continuous assistance, while improving external support such as policies and market access. Strengthening facilitation and integrating empowerment with economic opportunities are key to sustaining participation and ensuring program success.

Compliance with ethical standards

Disclosure of Conflict of interest

No conflict of interest to be disclosed.

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