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Embung Bandung Bondowoso Tourism Sustainability Strategy in Sidobandung Village, Balen District, Bojonegoro Regency

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Abstract: Embung Bandung Bondowoso Tourism offers water tourism which originates from the Pacal River, Bojonegoro Regency. The choice for developing Embung Bandung Bondowoso tourism is because it is to utilize the embung which has been owned since 2020. Even though Bandung Bondowoso tourism has been open since February 1st 2022 and is currently still in the development process. The development of tourist villages is also a form of accelerating integrated village development to encourage social, cultural and economic transformation of villages. This research uses quantitative research methods. In this research, this was done by filling out a Multidimensional Scaling questionnaire and then analyzing the quantitative data obtained to answer the problem formulation regarding the sustainability status of the research location. The resulting index value shows that the 5 dimensions (ecological, social, economic, institutional and technological) of Embung Bandung Bondowoso Tourism already have very good sustainability status. The sensitive attributes that most influence sustainability and need to be considered are green open spaces, condition and availability of clean water, landslides, erosion and damage to water resources, conflicts of interest between residents, level of education, development of local products, community service providers and ease of reaching the location.

Keywords: Bojonegoro; Multidimensional scaling; Strategy; Sustainability; Tourism

Introduction

In Indonesia, the proliferation of embungs, or water reservoirs, is a significant development in the context of water resource management. This initiative has gained momentum due to government support, particularly through the issuance of Presidential Instruction No. 1 of 2018, which emphasizes the acceleration of reservoir construction and other water storage facilities in rural areas. The primary objective of these reservoirs is to capture and store rainwater and surface runoff, thereby providing a reliable water source for agricultural activities, especially during the dry season when water scarcity is prevalent. The reservoirs serve not only as irrigation supplements for secondary crops and seasonal horticulture but also as vital resources for livestock farming, thereby enhancing food security in rural communities (Floren et al., 2019; Suni et al., 2023).

The construction of embungs, such as the one in Sidobandung Village, exemplifies the government's commitment to improving agricultural resilience against climate variability. The reservoir built in 2020 aims to mitigate the impacts of drought by ensuring that farmers have access to water throughout the dry season. This is particularly crucial in regions where traditional water supply methods are insufficient to meet agricultural demands. The Sidobandung Village government has recognized the potential of these reservoirs to extend beyond agricultural use, envisioning their role in tourism development. This aligns with broader governmental policies aimed at promoting rural tourism as a means to stimulate local economies and enhance

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community livelihoods (Marcos et al., 2021; Suni et al., 2023).

The effectiveness of embungs in addressing water scarcity issues is supported by various studies that highlight the importance of rainwater harvesting systems in Indonesia. For instance, research indicates that rainwater harvesting can significantly contribute to water supply, particularly in regions experiencing prolonged dry seasons (Rhamadita et al., 2023; Suni et al., 2023). The implementation of such systems not only aids in agricultural irrigation but also promotes sustainable water management practices that are essential in the face of climate change (Floren et al., 2019; Suni et al., 2023). Moreover, the integration of Geographic Information Systems (GIS) in identifying potential sites for embung construction has proven beneficial, allowing for strategic planning and resource allocation to maximize the benefits of these water storage systems (Syarifuddin et al., 2024).

In addition to their agricultural benefits, embungs have the potential to enhance local biodiversity and ecological health. By creating water bodies in arid regions, these reservoirs can support various forms of wildlife and contribute to the overall ecological balance. Furthermore, the environmental functions of embungs, such as flood control and sediment management, are critical in maintaining the health of surrounding ecosystems (Floren et al., 2019). The dual role of embungs as both agricultural and ecological assets underscores the need for integrated water resource management strategies that consider the multifaceted benefits of such infrastructure.

The tourism potential of embungs, particularly in areas like Sidobandung Village, is an emerging area of interest. The government's push for developing tourist villages as a means of economic growth aligns with the utilization of embungs as recreational and educational sites. This not only diversifies the local economy but also raises awareness about sustainable water management practices among visitors and residents alike. The promotion of eco-tourism centered around these water bodies can foster community engagement and investment in the preservation of local natural resources (Suni et al., 2023; Marcos et al., 2021).

The sustainability of embungs is contingent upon effective management practices that ensure their longevity and functionality. Studies emphasize the importance of community involvement in the maintenance and operation of these reservoirs, as local stakeholders are often best positioned to manage resources sustainably (Daniel et al., 2021). The integration of community participation in water management strategies can lead to more resilient and adaptive systems that respond effectively to changing environmental conditions (Daniel et al., 2021).

The tourism sector can be a driver of a number of economic activities, both formal and informal, to improve the welfare of local residents (Holik, 2019). Of course, tourism is a sector that has received attention in the world in the last few decades. Not only does economic growth and an increase in export income be obtained, but tourism activities make the tourism sector one of the sectors that is able to become a means of publicity in the area where the tourist attraction is located. Indonesia is a country with abundant natural resources consisting of sea and land which, if managed properly, can provide huge benefits for the country. One of the uses is to create the area as a tourist destination (Setiawan, 2019).

Embung Bandung Bondowoso Tourism in Sidobandung Village represents a significant development in the integration of water resources and tourism, capitalizing on the natural beauty and recreational potential of the embung, which has been in existence since 2020. This initiative aims to provide a venue for water-based activities, such as water games, children's playgrounds, and water biking, while also seeking to enhance the local economy through tourism. The development of such tourism ventures aligns with broader governmental objectives aimed at fostering integrated village development, which is crucial for social, cultural, and economic transformation in rural areas (Hidayattuloh et al., 2020; Meirejeki et al., 2022).

The strategic choice to develop tourism around Embung Bandung Bondowoso is rooted in the potential for economic diversification beyond traditional agriculture. While agriculture remains a critical component of the local economy, the introduction of tourism can provide additional revenue streams that are essential for community resilience, especially in the face of climatic challenges that threaten agricultural productivity (Hidayattuloh et al., 2020; Zheng et al., 2023). The establishment of this tourism site is indicative of a growing trend in Indonesia, where local governments are increasingly recognizing the value of leveraging natural resources for sustainable economic development.

The management of tourism in Sidobandung Village must adopt an integrated approach that considers environmental sustainability, cultural preservation, and community involvement. Effective management models for tourism villages emphasize the importance of holistic planning that synchronizes various sectors and stakeholders to create competitive advantages and sustainable tourism practices (Hidayattuloh et al., 2020; Meirejeki et al., 2022). This is particularly relevant in the context of Sidobandung,

where the local community can play a pivotal role in the development and management of tourism activities, ensuring that the benefits are equitably distributed and that local culture is preserved (Andari et al., 2024; Putra et al., 2023).

The potential for Embung Bandung Bondowoso to serve as a cultural and natural attraction is significant. By integrating local cultural elements into the tourism experience, the village can enhance its appeal to visitors while fostering a sense of pride and ownership among residents. This approach aligns with the principles of community-based tourism, which prioritize local participation and benefit-sharing as key components of sustainable tourism development (Indratno et al., 2023; Nuryanto et al., 2020). Such initiatives not only contribute to economic growth but also promote social cohesion and cultural exchange, enriching the overall tourist experience.

Furthermore, as the tourism sector in Sidobandung Village continues to evolve, it is essential to implement strategies that address potential challenges, such as environmental degradation and the over-commercialization of natural resources. Sustainable tourism practices, including the promotion of eco-friendly activities and the preservation of local ecosystems, are vital for maintaining the integrity of the embung and surrounding areas (Setyobakti et al., 2021; Tian et al., 2023). The development of tourism should be guided by principles that ensure the long-term viability of both the natural environment and the local community, fostering a balance between economic development and ecological sustainability (Muslim, 2016).

Sustainable tourism development is a process and system that ensures the sustainability of natural resources and socio-cultural life, as well as providing economic benefits for future generations. Therefore, it is necessary to plan a sustainable development concept to maximize this potential (Aji, 2020). Therefore, a sustainability strategy for Embung Bandung Bondowoso tourism is very necessary for the sustainability of Embung Bandung Bondowoso tourism in the future.

Method

This research uses quantitative research methods. According to Sugiyono (2019) quantitative research is a research method based on positivistic (concrete data), research data in the form of numbers that will be measured using statistics as a calculation test tool, related to the problem being studied to produce a conclusion. This research took place at Embung Bandung Bondowoso Tourism, Sidobandung Village, Balen District, Bojonegoro Regency. The research was conducted in September 2023 – December 2023. In this research, this was done by filling out a Multidimensional Scaling questionnaire and then analyzing the quantitative data obtained to answer the problem formulation regarding the sustainability status of the research location.

This research has a concept for assessing and analyzing the sustainability of Embung Bandung Bondowoso tourism, Sidobandung Village, Balen District, Bojonegoro Regency, which includes five dimensions, namely ecological, economic, social, institutional and technological dimensions.

Table 1. Dimensions and Attributes of the Sustainability Status Assessment of Embung Bandung Bondowos Tourism

Ecological Dimensions
Water Conditions
Waste management
Cleanliness
Condition and Availability of Clean Water
Natural Environment Conservation and Wildlife Protection
Green open space
Supporting facilities
Landslides, Erosion and Damage to water resources
Economic Dimensions
Increase in Family Income
Business opportunities
Job Opportunities
Local Product Development
Increasing Tourist Purchasing Power
Tourist Levy
Development of Other Tourism Services
Social Dimensions
Level of education
Increased Population Density
Society participation
Conflict of Interest Between Citizens
Security
The Value of Mutual Cooperation
Socio-Cultural Attractions
Institutional Dimensions
Human resource capacity building activities
Frequency of coordination between stakeholders
Partnership collaboration with other parties
Pokdarwis
Government policy support
Coaching frequency
Management and marketing agency
Technology Dimensions
Waste Management Facilities
Water Access Facilities
Condition of Public Facilities
Road Conditions
Ease of Reaching the Location
Location Signage
Technology Development

Secondary data was obtained through observation and documentation. Table 2 shows the sustainability status of each dimension by category.

Table 2. Sustainability Status Category (Kholil, 2014)

Index Value	Sustainability category
0 ± 25.00	Bad (unsustainable)
25.01 ± 50.00	Less (less sustainable)
50.01 ± 75.00	Sufficient (sustainable enough)
75.01 ± 100.00	Good (very sustainable)

Monte Carlo analysis was used to test the effect of errors at the 95% confidence level. Monte Carlo analysis helps account for uncertainty. The analysis results are expressed in the form of a Monte Carlo index, which will then be differentiated from the index value from the MDS analysis results. The smaller the difference between the average Monte Carlo index and the MDS sustainability index, the smaller the influence of errors in the overall analysis process (Then et al., 2020). Leverage analysis is used to determine the sensitive attributes of each dimension. Sensitive attributes are attributes that are considered to have the most influence on sustainability and are measured through changes in Root Mean Square (RMS). The larger the RMS, the greater the influence and the more sensitive it is to sustainability status.

Result and Discussion

The sustainability status of Embung Bandung Bondowoso Tourism in Sidobandung Village is evaluated through five dimensions of sustainable development: ecological, social, economic, institutional, and technological. Each dimension is assessed using specific attributes, with the ecological dimension scoring 88.45, social dimension 81.02, economic dimension 82.84, institutional dimension 76.28, and technology dimension 78.10. These scores indicate that all dimensions are in a good or sustainable status, reflecting a comprehensive approach to sustainability that encompasses various aspects of development (Fauzel et al., 2023; Guo et al., 2019).

The ecological dimension, with its high score, underscores the importance of environmental sustainability in tourism development. Sustainable tourism emphasizes the need for tourism activities to harmonize with ecological preservation, ensuring that natural resources are utilized responsibly and remain available for future generations (Wu et al., 2022). This aligns with the findings of studies that highlight the critical role of environmental management in achieving sustainable tourism outcomes, where the integration of ecological considerations into tourism planning is essential for long-term viability (Ilieva et al., 2023).

The social dimension, scoring 81.02, reflects the significance of community involvement and social equity in tourism development. Engaging local communities in the tourism process not only enhances their livelihoods but also fosters a sense of ownership and responsibility towards the preservation of cultural and natural resources (Li et al., 2023; Sharpley, 2020). Research indicates that community-based tourism initiatives can lead to improved social cohesion and cultural exchange, which are vital for the sustainability of tourism destinations (Manzoor et al., 2019). The positive social impacts observed in Sidobandung Village can serve as a model for other regions seeking to balance tourism development with community welfare.

Economic sustainability, with a score of 82.84, highlights the potential of tourism to contribute to local economic growth. The tourism sector can create jobs, stimulate local businesses, and generate income for communities, thereby enhancing their overall economic resilience (Chamidah et al., 2020; Han, 2021). However, it is crucial to ensure that economic benefits are distributed equitably among community members to avoid disparities that can arise from tourism development (Lovelesh et al., 2024). The integration of sustainable practices in tourism can further enhance economic outcomes by attracting a more conscientious visitor demographic that values sustainability (Narkūnienė, 2024).

The institutional dimension, scoring 76.28, emphasizes the need for effective governance and policy frameworks to support sustainable tourism development. Strong institutions are essential for coordinating efforts among various stakeholders, including government agencies, local communities, and the private sector (Dzyad et al., 2020; Stacchini et al., 2022). Research has shown that effective governance structures can facilitate the implementation of sustainable tourism policies and practices, ensuring that all dimensions of sustainability are addressed (Peng, 2012). In the case of Sidobandung Village, ongoing collaboration among stakeholders will be critical to maintaining the sustainability of the embung and its associated tourism activities.

Lastly, the technological dimension, with a score of 78.10, points to the role of innovation and technology in enhancing the sustainability of tourism operations. The adoption of sustainable technologies can improve resource efficiency, reduce environmental impacts, and enhance the overall visitor experience (Brankov et al., 2015; Zou, 2023). Studies indicate that leveraging technology in tourism can lead to better management practices, increased visitor engagement, and improved environmental outcomes (Panayiotopoulos et al., 2019). In Sidobandung Village, the integration of technology in

tourism management could further enhance the sustainability of the embung and its offerings.

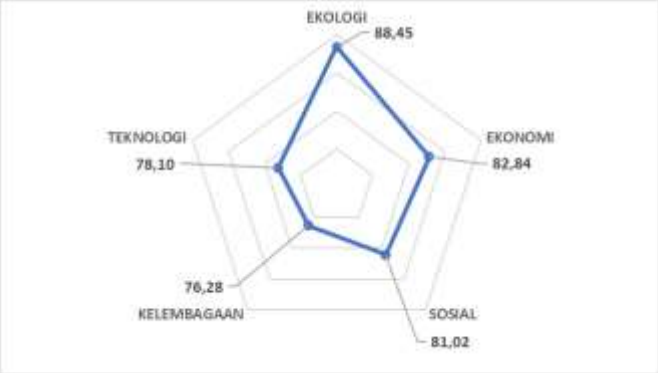

Figure 1. Index and sustainability status of tourism management at Embung Bandung Bondowoso Sidobandung Village, Balen District, Bojonegoro Regency (Source: Data analysis results, 2023)

Table 3. Differences in Sustainability Index Values from MDS and Monte Carlo Analysis

Dimensions	Sustainability Index Value		Difference
	MDS	Monte Carlo	
Ecology	88.45	88.45	0.08
Economy	82.84	82.84	0.00
Social	81.02	81.02	0.00
Institutional	76.28	76.28	0.00
Infrastructure	78.10	78.10	0.08

Source: Data analysis results, 2023.

Viewing the error rate in MDS analysis can be done by comparing the difference between the Rapfish and Monte Carlo values (Table 3). The difference between the two shows that the sustainability index value has a small error value in the analysis (Then et al., 2020). The difference between MDS and Monte Carlo is less than 1, indicating that the MDS value calculation shows the true value with a high level of precision (Maharani, 2019).

Ecological Dimension

The results of the MDS analysis show that the Ecological dimension has a sustainable status with a sustainability index value of 88.45. The ecological sustainability index value is influenced by 7 attributes as the basis for assessing sustainability. These attributes are (1) Water Condition, (2) Waste Management, (3) Cleanliness, (4) Condition and Availability of Clean Water, (5) Preservation of the Natural Environment and Protection of Wild Animals, (6) Green Open Space, (7) Supporting Facilities and (8) Landslides, Erosion and Damage to water resources. Based on Figure 3, it can be seen that the sensitive attribute that most influences the sustainability of this dimension is (6) Green Open Space, followed by (4) Condition and Availability of Clean Water and (8) Landslides, Erosion and Damage to water resources, so that if you want to maintain or increasing sustainability value, we must pay more attention to these 3 attributes so that sustainability status does not decline in the future.

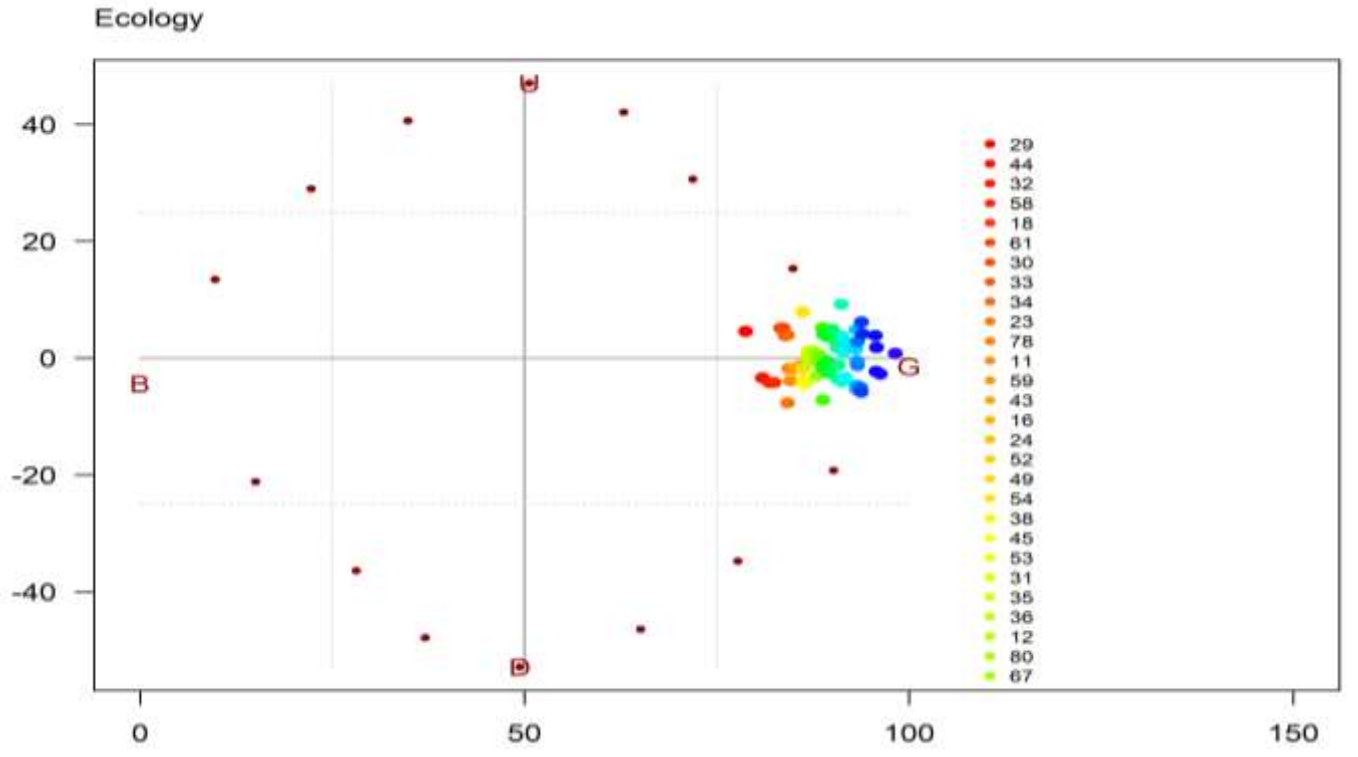

Figure 2. Distribution of attribute data on ecological dimensions

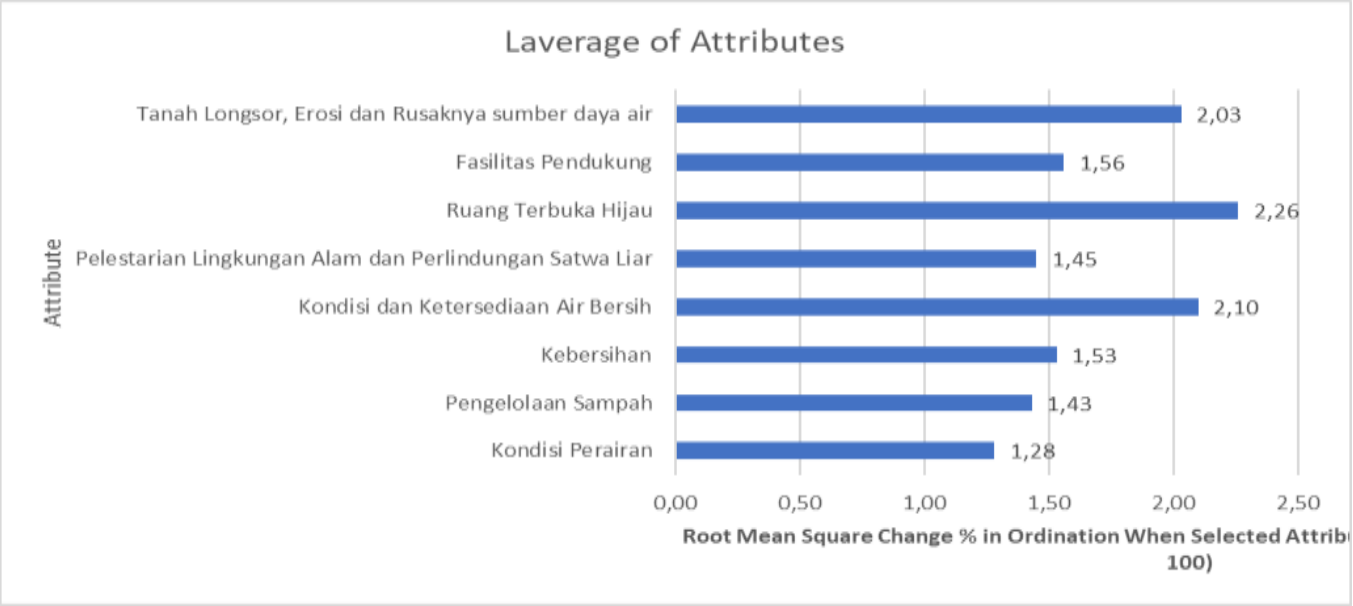

Figure 3. Sensitive attributes that influence the sustainability of the ecological dimension of Embung Bandung Bondowoso tourism management, Sidobandung Village, Balen District, Bojonegoro Regency

The area of the tourist area is very large with an area of almost 5 hectares but the availability of trees at the tourist location is not very large because trees have not been planted for a long time. Planting trees is beneficial for the survival of different living creatures that exist. Due to rapid development, many trees were cut down. As a result, geothermal heat increases and the amount of water supplied underground decreases. Therefore, planting trees can absorb certain pollutants and filter the dust that is often found in the air. Therefore, we need to work together and share our roles in preserving this planet. Planting trees means you have done a good job in managing the environment, protecting water sources, and maintaining clean air (Wattimena et al., 2019). By growing the trees that have been planted, it is hoped that it can increase the availability of green open space in Sidobandung Village, Balen District, Bojonegoro Regency and ensure that its sustainability does not decrease. Clean water is very abundant because it is supported by PAM (Drinking Water Company) so that cleanliness and availability are guaranteed (Mahdani et al., 2022). The available water is also used to irrigate newly planted trees so that their growth is fast and not hampered. Apart from that, PAM water is also used for toilet purposes at tourist sites. Then for the third sensitive factor, so far there have never been any landslides or erosion so it is necessary to prevent erosion so that landslides do not occur at tourist locations. If damage is not prevented, the possibility that will occur is a decrease in the number of tourists and damage to tourist attractions (Herwanda et al., 2022). Based on the activities carried out by Webliana et al. (Webliana B et al., 2020), overcoming erosion and landslides can be carried out using palm oil waste because there is a lot of palm oil waste that is not utilized while the activities mentioned by Erwanto et al. (2021) state that overcoming erosion in Sumberbulu Village, Banyuwangi uses Gully Plugs to protect the land from erosion. From several sources above, it can be said that preventing erosion or landslides can be done by adjusting land conditions and can also use other alternatives that are already available in the village.

Economic Dimension Sustainability Index

The results of the MDS analysis show that the economic dimension has a sustainable status with a sustainability index value of 82.85. Good sustainability status needs to be maintained so knowledge is needed regarding sensitive attributes in improving sustainability status through Leverage analysis. The economic sustainability index value is influenced by 8 attributes as the basis for assessing sustainability. These attributes are (1) Increase in Family Income, (2) Business Opportunities, (3) Job Opportunities, (4) Local Product Development, (5) Increase in Tourist Purchasing Power, (6) Tourist Levy, (7) Service Development Other Tourism and (8) Increasing Village PAD. Based on the results of the Leverage test in Figure 5, it can be seen that the development of local products is the most sensitive factor that needs to be improved or maintained so that the sustainability status of the economic dimension of tourism does not decline.

The development of local products is still very lacking even though there are those who sell, but the products sold are not local products or only a few sell local products, namely dry cakes. There is one approach that can be applied in building a local product industry,

namely the OVOP (One Village One Product) approach or the one village one product program. This program is a community-based approach which aims to develop the potential of a region in an integrated manner so that people's income, welfare, pride and self-confidence in their region can increase. The OVOP approach can be carried out by (1) determining the product to be developed, (3) identifying product development potential and problems related to product development, (3) providing guidance to local communities related to processing, technology used, improving quality, distribution of production results and their expansion, (4) increasing human resource capabilities, and (5) monitoring and evaluating business activities for improvement (Rakhmawati, 2019).

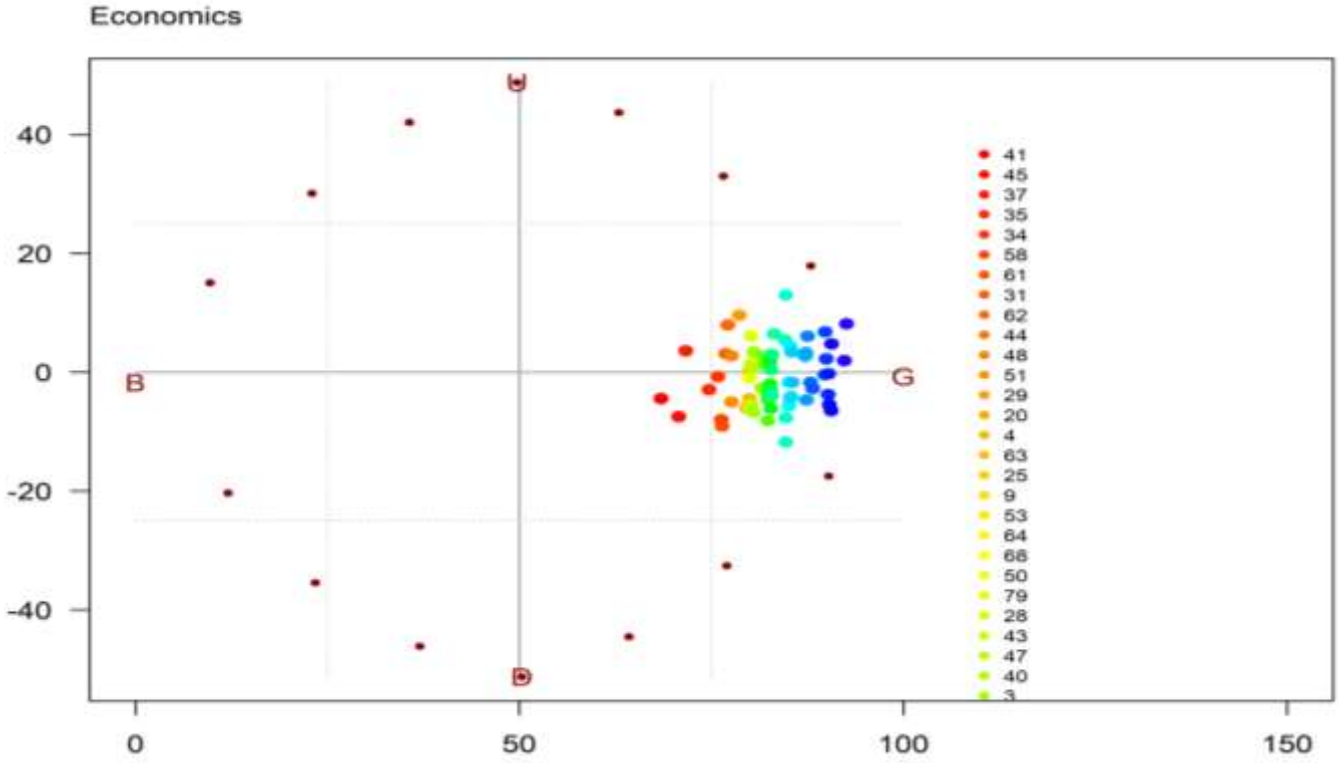

Figure 4. Distribution of attribute data on economics

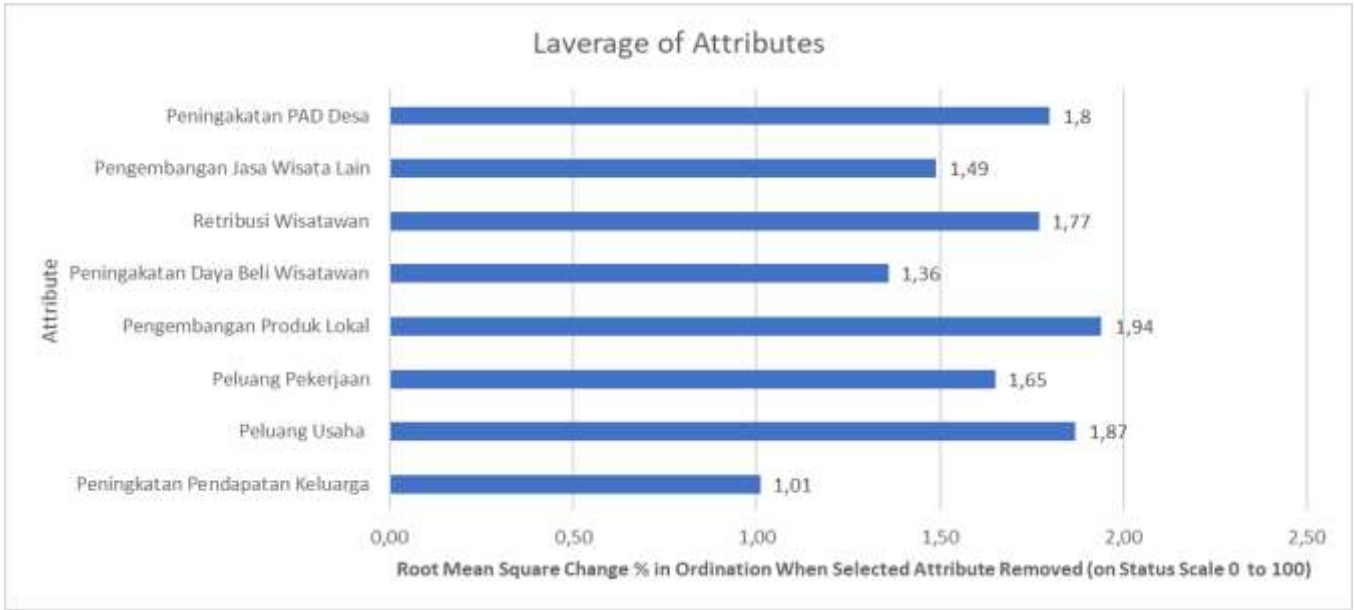

Figure 5. Sensitive attributes that influence the sustainability of the economic dimension tourism management Embung Bandung Bondowoso Sidobandung Village Balen District Bojonegoro Regency

Social Dimensions

The results of the MDS analysis show that the social dimension has a sustainability index value of 86.46. This index value shows that the social dimension is included in the sustainable dimension so that the strategy needed is to maintain its sustainability. The social dimension sustainability index value is influenced by 7 attributes as the basis for assessing sustainability. These attributes are (1) Education Level, (2) Increased Population Density, (3) Community Participation, (4) Conflict of Interest Between Citizens, (5) Security, (6) Value of Mutual Cooperation and (7) Socio-Cultural Attractions. Figure 7 is the result of leverage from the social dimension. In this figure it can be seen that the attributes of conflict of interest between citizens and level of education are sensitive attributes that can be used to maintain the sustainability of the social dimension.

At the beginning of the construction of the embung, there was conflict because there were residents who did not agree with the construction, but now the level of conflict that occurs is very small because the benefits of the embung are felt. Conflicts that have occurred should be prevented so as not to reduce sustainability in this dimension. In addition, conflict resolution patterns in one region may not necessarily be applied in other regions. Therefore, in determining procedures for resolving various conflict cases, objectivity must be maintained within the framework of the local situation, as well as paying attention to and analyzing them based on universal conflict theory, so it is also necessary to use local paradigms. Important elements that form the basis of conflict analysis and resolution include: stakeholders, stages or levels of conflict, issues and causal factors, type of conflict, local direction or policy, resource potential, type of violence, territory, capabilities and tools and also includes communication (Astri, 2011).

The level of education among the residents surrounding the Embung Bandung Bondowoso varies significantly, with a predominant number having only attained elementary and middle school education. This educational disparity is often attributed to the perception that the costs associated with education are prohibitively high relative to the perceived benefits, a sentiment echoed in earlier studies (Aceves et al., 2020; Sicular et al., 2008). For instance, Suseno (1997) noted that societal views on education can significantly influence enrollment and completion rates, particularly in rural areas where economic constraints are more pronounced.

Research conducted in Offinso City supports the assertion that education directly impacts productivity; however, the benefits are mitigated by low literacy levels and inadequate educational attainment (Kawuryan et al., 2022). This aligns with findings from Julianto et al. (2019), which demonstrate a strong correlation between educational levels and individual income, indicating that higher education levels typically lead to increased earning potential. Such relationships are crucial in understanding the socio-economic dynamics within rural communities, where limited educational opportunities can perpetuate cycles of poverty and hinder economic development (Bahri et al., 2023; Huang, 2023).

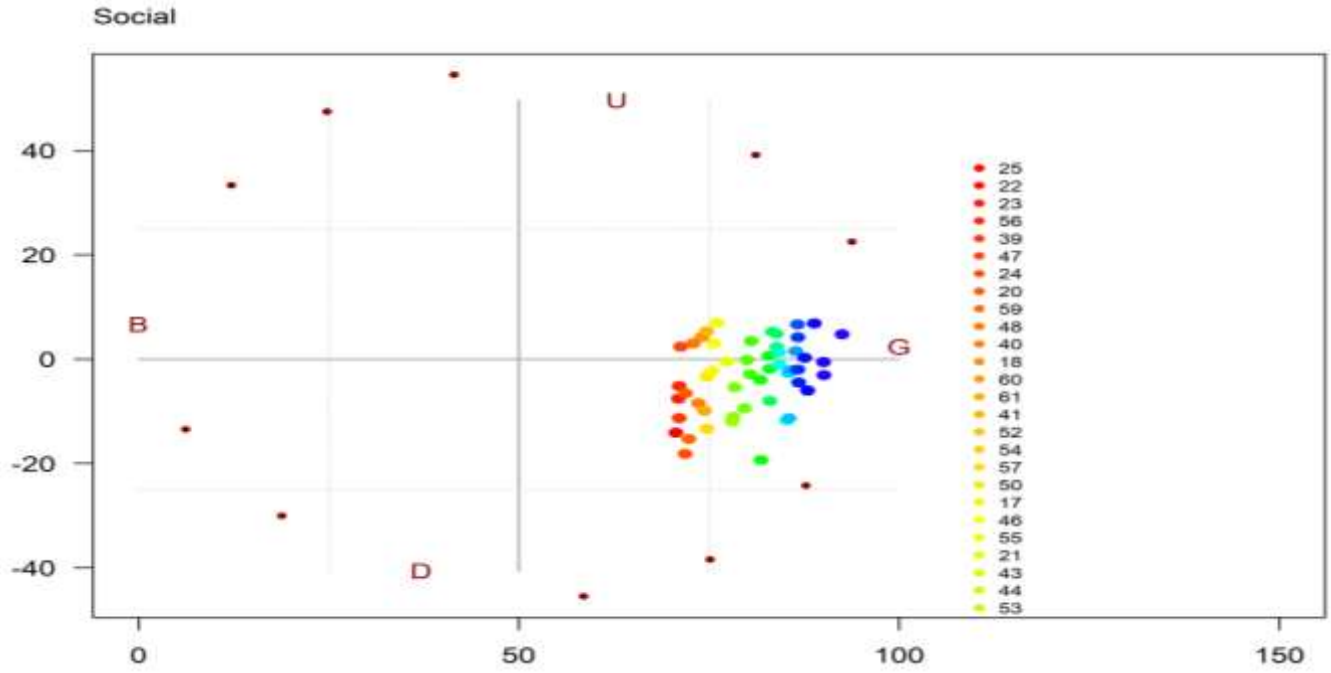

Figure 6. Distribution of attribute data on social dimensions

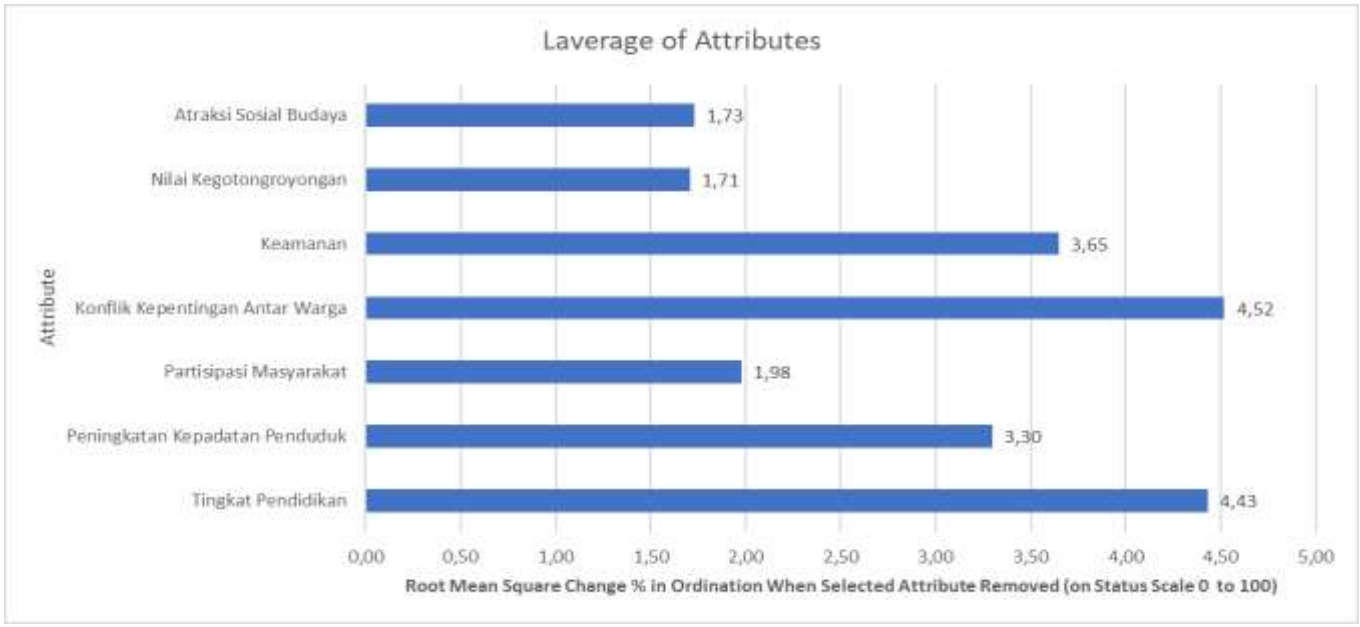

Figure 7. Sensitive attributes that influence the sustainability of the social dimension of Embung Bandung Bondowoso Tourism Management, Sidobandung Village, Balen District, Bojonegoro Regency

Moreover, the challenges faced by rural populations in accessing quality education are compounded by systemic inequalities. For example, studies have shown that educational resources are often disproportionately allocated, favoring urban areas over rural ones, which exacerbates the educational divide (Bakti et al., 2024; Fu et al., 2010). This disparity not only affects immediate educational outcomes but also has long-term implications for economic mobility and community development. The lack of access to quality education in rural settings can lead to lower levels of human capital, which in turn affects local productivity and income levels (Sari et al., 2023; Wang et al., 2020).

In the context of Indonesia, the government has recognized the need for educational reforms aimed at improving access and quality in rural areas. Initiatives that focus on enhancing educational infrastructure and providing resources for teacher training are essential for bridging the educational gap (Moniruzzaman et al., 2021; Zhang et al., 2022). Furthermore, community involvement in educational planning and implementation can foster a sense of ownership and accountability, leading to more sustainable educational outcomes (Ding, 2024; Zhao, 2024).

Institutional Dimensions

The results of the MDS analysis show that the institutional dimension has a sustainable status with a sustainability index value of 76.28. This index value is already very good so it needs to be maintained and improved so that it remains in a sustainable status. The institutional sustainability index value is influenced by 7 attributes as the basis for sustainability assessment. These attributes are (1) Human resource capacity building activities, (2) Frequency of coordination between stakeholders, (3) Partnership collaboration with other parties, (4) Tourism Awareness Group (TAG), (5) Government policy support, (6) Frequency of coaching, (7) Management and marketing agency. Based on Figure 9 below, it can be seen that there is 1 attribute that is most sensitive in influencing the sustainability of the institutional dimension of the Embung Bandung Bondowoso Tourism effort, Sidobandung Village, Balen District, Bojonegoro Regency, namely Tourism Awareness Group (TAG).

The Tourism Awareness Group (TAG) plays a pivotal role in enhancing tourism in the region, particularly through initiatives such as the introduction of new attractions and collaborations with educational institutions for promotional activities. This aligns with the objectives outlined by TAG, which include increasing community involvement in tourism development and fostering synergies with stakeholders (Asmoro et al., 2021; Ikrimah et al., 2023). The active engagement of TAG in these areas is critical for the sustainable development of tourism, as it empowers local communities to take ownership of their tourism assets and enhances the overall visitor experience.

The collaboration between TAG and institutions such as PPNS Surabaya to develop solar energy solutions for tourist areas exemplifies the integration of sustainable practices into tourism management. This approach not only addresses energy needs but also aligns with the growing emphasis on low-carbon tourism initiatives. Research indicates that collaborative governance models, which involve multiple

stakeholders, are essential for achieving sustainable tourism outcomes (Ma'arif et al., 2023; Taufik et al., 2023). By leveraging the expertise of educational institutions and local communities, TAG can enhance the sustainability and attractiveness of tourism offerings in Sidobandung Village.

Promotional activities targeting schools and educational institutions are also a strategic move to increase awareness and participation in local tourism. Studies have shown that educational outreach can significantly enhance community engagement and foster positive attitudes towards tourism development (Islahuddin et al., 2021, 2022). By facilitating outbound activities for students, TAG not only promotes tourism but also instills a sense of pride and ownership among younger generations, which is crucial for the long-term sustainability of tourism initiatives (Afrisal, 2022).

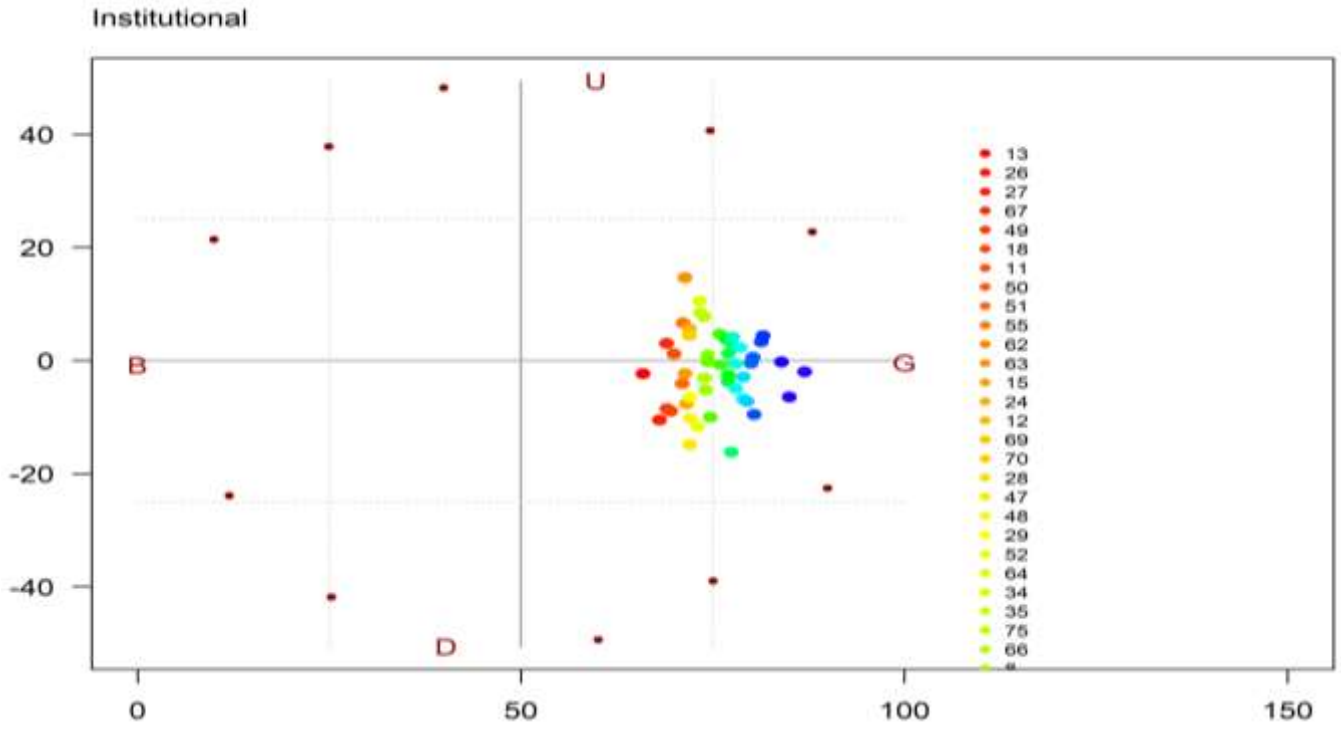

Figure 8. Distribution of attribute data on institutions

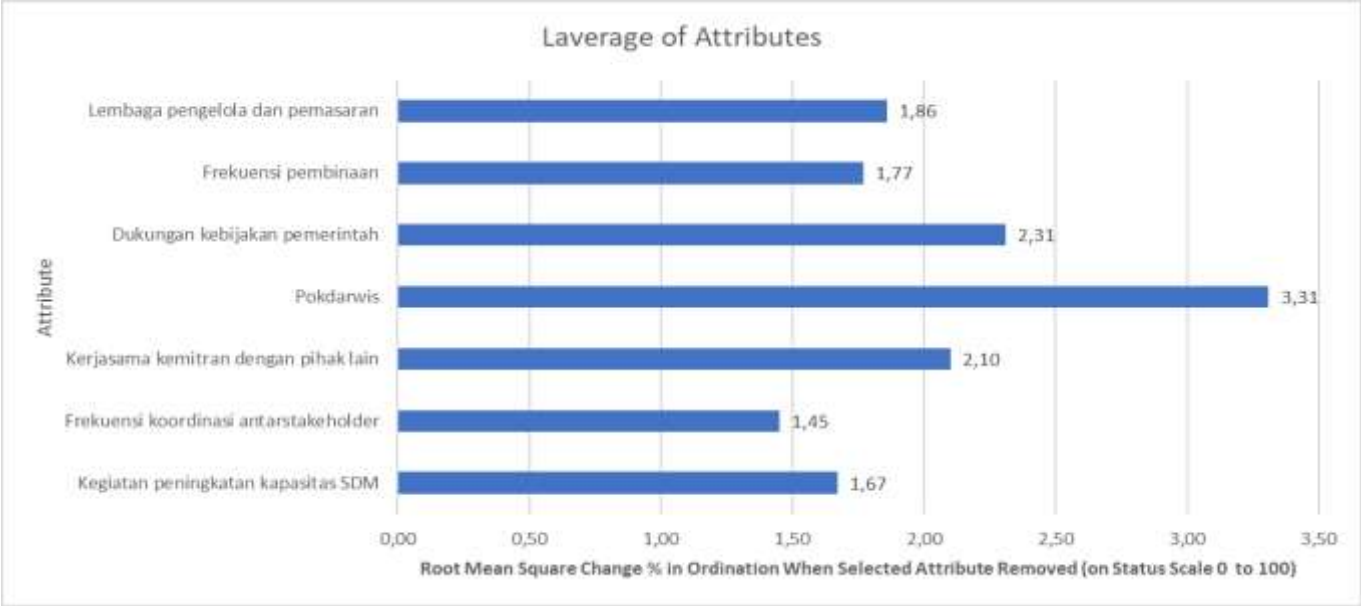

Figure 9. Sensitive attributes that influence the sustainability of the institutional dimensions of Embung Bandung Bondowoso Tourism Management, Sidobandung Village, Balen District, Bojonegoro Regency

Moreover, the emphasis on community involvement in tourism development is supported by literature that highlights the importance of stakeholder collaboration in achieving sustainable tourism goals. Effective stakeholder engagement ensures that the interests and needs of local communities are considered in tourism planning and management, leading to more equitable and sustainable outcomes (Anderson et al., 2012; Ma'arif et al., 2023). The role of TAG in mobilizing community participation and fostering collaboration among various stakeholders is therefore vital for the success of tourism initiatives in the region.

Technology Dimension

The results of the MDS analysis show that the Technology dimension has a sustainable status with a sustainability index value of 86.15. This sustainability index value is influenced by 4 attributes, namely (1) Waste Management Facilities, (2) Water Access Facilities, (3) Condition of Public Facilities, (4) Road Condition, (5) Ease of Reaching the Location, (6) Location Signage and (7) Technology Development. After carrying out the Leverage test, it can be seen in Figure 11 that the most sensitive attribute is the ease of reaching tourist locations.

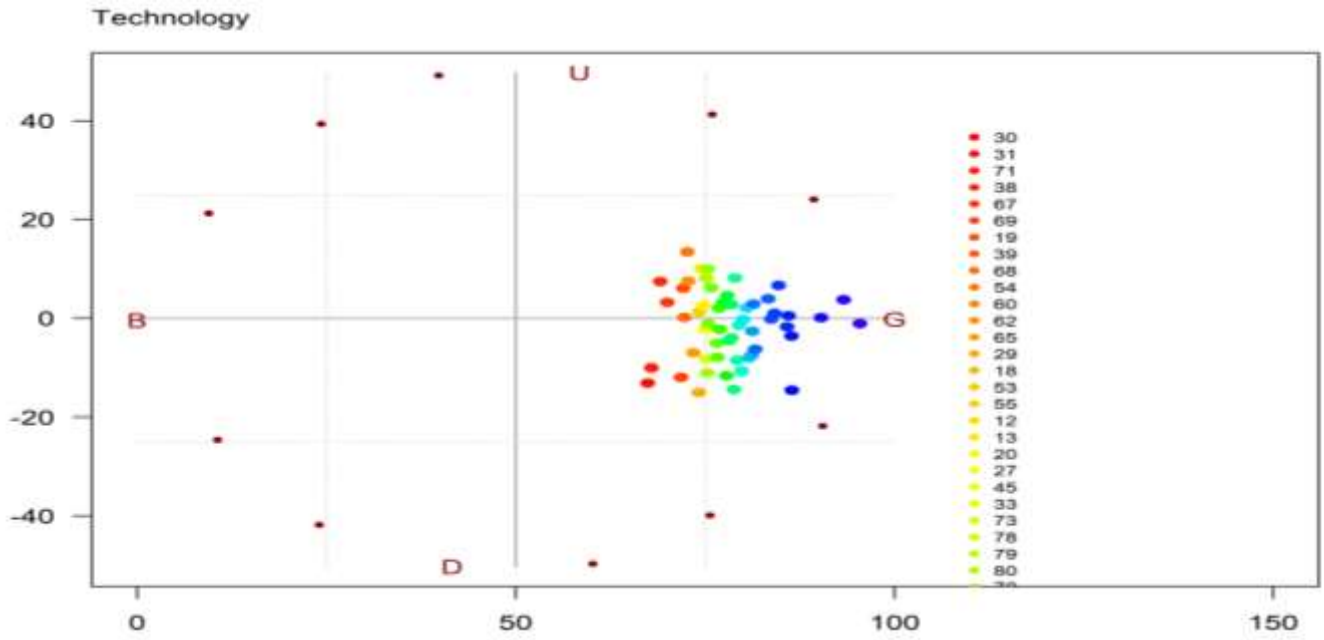

Figure 10. Distribution of attribute data on technology dimensions

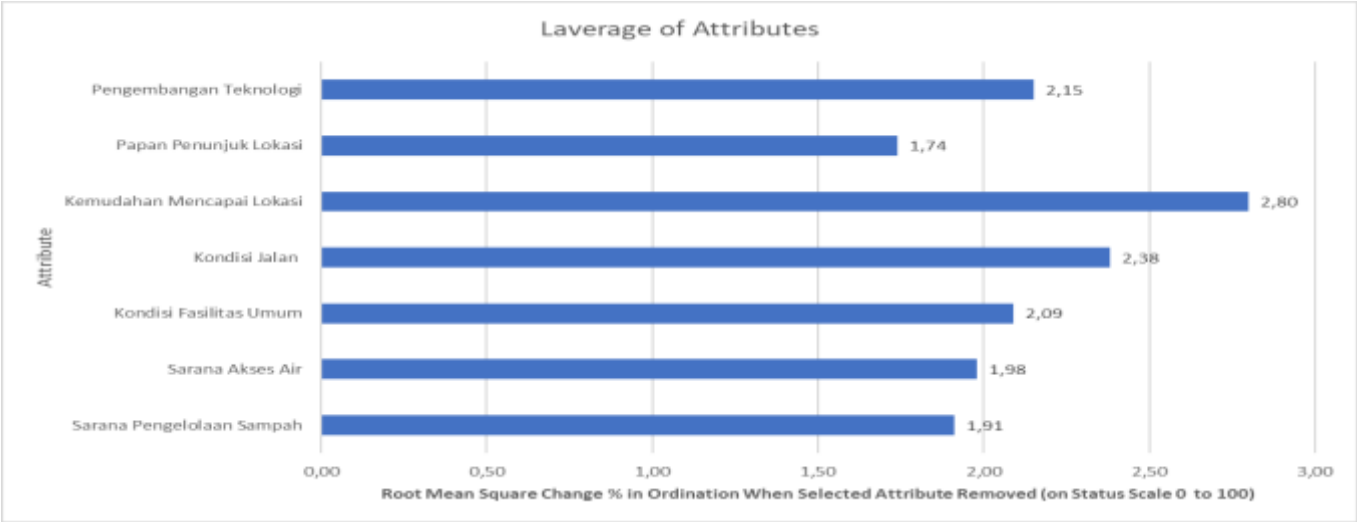

Figure 11. Sensitive attributes that influence the sustainability of the technological dimension of Embung Bandung Bondowoso Tourism Management, Sidobandung Village, Balen District, Bojonegoro Regency

Tourist access to tourist locations is very easy because the road to the tourist attraction is flat and concreted. Apart from that, there are signposts around the road that make it easier for tourists to enter the

tourist attraction. The Embung Bandung Bondowoso tourist location is also very strategic because it is located on the village main road and the district main road. The easier it is to access a tourist destination, the greater the number of visits from tourists (Siagian et al., 2022). Accessibility also includes infrastructure facilities that tourists need to reach tourist destinations, so public services such as vehicle rental and local transportation, easy routes or travel patterns must be available (Chaerunissa et al., 2020).

From the 5 dimensions above, there are several sensitive attributes that have been collected based on their dimensions, namely: Waste management facilities, business capital assistance, contribution to Original Village Income (PADesa), conflict between government and residents, role of private institutions, facilities and transportation infrastructure, the role of environmentally conscious groups.

Conclusion

The resulting index value shows that the 5 dimensions (ecological, social, economic, institutional and technological) of Embung Bandung Bondowoso Tourism, Sidobandung Village, Balen District, Bojonegoro Regency already have very good sustainability status. The sensitive attributes that most influence sustainability and need to be considered are green open spaces, condition and availability of clean water, landslides, erosion and damage to water resources, conflicts of interest between residents, level of education, development of local products, community service providers and ease of reaching the location.

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The authors declare no conflict of interest.

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