

Sustainable Village Development Around Bukit Rimbang Bukit Baling Wildlife Reserve In Kampar Kiri Hulu District Of Kampar Regency

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ABSTRACT

The majority of Indonesia's rural population is dependent on living in and around forest areas. They existed before the state established the land as a forest area. The economic and social activities of rural communities in utilizing forest resources are often accused of causing environmental damage. As a result, measures to promote village development in the Wildlife Sanctuary are required not only to ensure ecological sustainability but also to maintain economic, social, law and governance continuity. The concept of sustainable rural development was developed to ensure the long-term sustainability of rural development within the Wildlife Reserve. This study scrutinizes the sustainability of rural development in the Bukit Rimbang Bukit Baling Wildlife Reserve in Kampar Kiri Hulu District, Kampar Regency. The analysis included ecological, social, economic, and law and governance dimensions. The RAPFISH was used to analyze the sustainability status. The results indicate that the economic dimension had the lowest value of 30.63, followed by law and governance dimensions of 41.24 and social dimensions of 44.83. The ecological dimension is categorized as a good category with a value of 51.29.

Keywords : Sustainable, Village, Wildlife

I. INTRODUCTION

The development paradigm has shifted from the old paradigm to a new paradigm that emphasizes sustainable development (Andrew, 1998). In the old paradigm, development was economic entries with a focus on economic growth through all means. The new paradigm promotes environmentally sound and sustainable growth. Without exception, every development stakeholder is involved in the decision-making process. According to the old paradigm, rural communities are viewed as development objects of rural development. Village development is intended to help development plans meet the central government's growth targets. The plan is implemented in a sectoral hierarchy, from the central government to local governments to the village level (Sangwan & Komal, 2015). Village stakeholders are parties who must accept the plans

and policies imposed by the upper hierarchy. Non-participatory planning and policymaking frequently result in horizontal and vertical conflicts (Wulan et al., 2004). Furthermore, multi-sectoral village development with overlapping regulations makes village resource management measures to improve rural community welfare less than optimal (Simarmata, 2018). The new paradigm of village development places rural communities as subjects in development. The dynamics of the village community's aspirations, customs, culture, and values are a source of evaluation and learning for quality, ecologically friendly, and sustainable economic growth.

Indonesia has 556 conservation areas spread over the province, comprising 27.14 million hectares (Wiratno, 2018). Badan Registrasi Wilayah Adat

(2022) reports that there were 1,582 customary territories, with 741 registered, 46 verified, 34 certified, and 761 newly registered. Nurjaya (2005) states that forestry development policies aimed only at achieving economic growth by extending forest management rights to capital owners have been able to promote national economic growth, increase national income and foreign exchange, and absorb labor. However, the damage of exploitation of forest resources has become uncontrollable and is not being routinely monitored. As a result, not only do ecological losses occur, but also social and cultural damage, such as access restrictions and the eviction of community rights, as well as the emergence of conflicts over the use of forest resources. The government's forest resource exploitation policy demonstrates that the degradation of the quality and quantity of forest resources in Indonesia is not only attributable to the people's low level of economic welfare and shifting cultivation. The destruction of forest resources is caused by the adoption of a state-based resource development paradigm, the implementation of centralized development management that is entirely focused on economic growth, and the employment of repressive policies and legal instruments.

Forest resource management that ignores the ecosystem and the importance of conservation zones in protecting life support systems will restrict community access to forest resources. Conservation areas that merely serve to preserve and utilize flora and fauna will create more immaterial losses. Taqwaddin, (2021) states that in general, all woods and forest areas can be used in line with their nature, characteristics, and vulnerabilities, and it is not permissible to change their main roles of conservation, protection, and production. The sustainability of the forest's main functions and conditions are maintained to restore forest quality and improve community empowerment and welfare. As a result, rural communities around and within forest areas are allowed to manage forests while also applying conservation measures, which will improve the community's economy without jeopardizing the forest.

Village development is focused on integrated actions and policies that balance social, economic,

and environmental concerns. The primary goals are to increase rural community income, create employment opportunities, improve local economic growth, and grow rural community economic institutions and organizations. The main concern of rural development in forest areas is the challenges faced by rural communities. These challenges include limited infrastructure and infrastructure, inadequate social facilities, and rural communities' restricted access to forest resource management. Rural development in forest areas becomes unsuccessful when the approach utilized is a sectoral approach that disregards rural development in forest areas as an ecosystem that provides protection for life support systems.

Sustainable village development strikes a balance among development factors such as ecological, social, economic, law and governance. Development based on the old paradigm prioritizes economic growth but is not directly proportional to environmental conditions, and may even promote less sustainable economic, social, ecological, and institutional development (Batistuta et al., 2021; Riniwati et al., 2021; Vatria, 2020). Similarly, a new development paradigm based solely on ecology and ignoring development as an ecosystem will generate better environmental conditions at the expense of increased economic and social welfare, as well as poor governance (Parmawati & Hardiansah, 2020; Narendra et al., 2019; Faridz et al., 2021). The sustainability of rural development ecosystems in forest areas is currently a strategic development challenge in establishing rural development ecosystems in forest areas that develop in a sensible way between ecological, economic, social, and law and governance dimensions.

The village community in the Bukit Rimbang Baling area existed long before the area was designated as a nature reserve. According to the Decree of the Governor of KDH Tk. I Riau No. 149/V/1982, the forest area around Bukit Rimbang Baling was classified as a nature reserve covering an area of 136,000 hectares on June 21, 1982. Subsequently, on May 23, 2014, it was designated as a Wildlife Reserve Area based on the Decree of the Minister of Forestry SK. 3977/Menhut-VIII/KUH/2014, covering an area of 141,226.25 hectares in Kampar Regency and Kuantan Singingi

Regency, Riau Province. The Bukit Rimbang Bukit Baling Conservation Forest Management Unit (CFMU/ KPHK) was then established on June 17, 2016, based on the Decree of the Minister of Environment and Forestry No. SK. 468/Menlhk/Sekjen/ PLA.0/6/2016. The people who live in the Bukit Rimbang Baling area were formerly part of the Gunung Sahilan Kingdom from the 16-17 century AD ruled by a king from the Pagaruyung kingdom in West Sumatra (Rahman & Veriasa, 2017). Since 2005, the Bukit Rimbang Baling Wildlife reserve community has been administratively constituted as a village and is part of the Kampar Regency in Riau Province (Ridhwan, et al, 2020). Currently, it is part of the administrative area of the Kampar Kiri Hulu district of the Kampar Regency.

Sustainable village development in forest areas is essential for the survival of the village development ecosystem, which must evolve in a balanced way. The villages in the Bukit Rimbang Baling Wildlife reserve Area, Kampar Kiri Hulu District, Kampar Regency have limited access and are isolated. There are eight villages whose settlements are located within the Bukit Rimbang Baling Wildlife reserve, namely the villages of Muaro Bio, Batu Sanggan, Tanjung Beringin, Gajah Bertalut, Aur Kuning, Terusan, Subayang Jaya, and Pangkalan Serai. The Subayang River serves as the only means of transportation for locals to get to the district. The village's topography is hilly and runs across the Bukit Barisan region, making it prone to flooding and landslides, especially with rising heavy rainfall and unpredictable seasons.

II. METHOD

This study was carried out in the villages around the Bukit Rimbang Baling Wildlife reserve, Kampar Kiri Hulu District, Kampar Regency. It includes 8 villages of Muaro Bio, Batu Sanggan, Tanjung Beringin, Gajah Bertalut, Terusan, Aur Kuning, Subang Jaya, dan Pangkalan Serai. The research was carried out from March 2021 to January 2022. The data in this study consisted of secondary and primary data. 91 respondents from purposive sampling were taken as samples. Sugiyono (2001) states that purposive sampling is a sampling

technique with certain considerations. According to Margono (2004), purposive sampling involves the selection of a group of subjects based on particular criteria that are thought to have a close relationship with previously known population characteristics. In other words, the sample unit that was contacted was subjected to specific criteria depending on the research objectives. The criteria used in this study are stakeholders related to village development in the Bukit Rimbang Bukit Baling Wildlife Reserve. At the village level, there are representatives from village officials, village community leaders, and environmental activists. At the government level, it includes those in charge of village development and conservation of forest areas such as the District Office, Community and Village Empowerment Service, Regional Development Planning Agency, and the Center for Natural Resources Conservation.

This study is based on four dimensions of sustainable village development including environmental, social, economic, and law and governance. Each dimension is formed by attributes that are arranged based on criteria with an ordinal scale or better known as Multidimensional Scaling (MDS) or a multivariate ordination. MDS is a multivariate statistical method that uses many parameters to determine the position of objects based on similarities and differences. The MDS is the most appropriate method to analyze the sustainability status of village development in the Bukit Rimbang Baling Wildlife Reserve, which uses multidimensionality and many indicators. Pitcher and Preikshot (2001) used MDS with RAPFISH to evaluate the comparative sustainability of fisheries. Ordination of attribute sets is performed using MDS followed by scaling and rotation. RAPFISH can also be used in other disciplines such as ecology, economics, ethics, social, and others. Monte Carlo simulation can be used to estimate the error, while the leverage of each attribute on the score is estimated using a stepwise procedure. Status results can be expressed on a scale of 0 to 100%, and scores from multiple fields can be combined in a kite chart. The attributes for each dimension of village development are as follows.

Table 1. Attributes for each dimension of Village Development in the Bukit Rimbang Bukit Baling Wildlife Reserve in Kampar Kiri Hulu District, Kampar Regency

Ecology	Social	Economy	Law and Governance
1. Green Open Spac (RTH) 2. Amenity Resource Utilization 3. Village Community Awareness of the Environment 4. Adaptation of Village Communities to climate change 5. Disaster Mitigation Capacity	1. Village community creativity 2. Involvement of indigenous peoples 3. Utilization of Cultural Products 4. Migration from the Wildlife reserve Area 5. Culture and Education 6. Village Community Empowerment 7. Village community social cohesion	1. Development of Village Leading Commodities 2. The bargaining position of the community in the Development of Leading Commodities 3. The role of BUMDES or together with BUMDES in Developing Leading Commodities 4. Basic Facilities and Infrastructure 5. Rural Community Financial Literacy Level 6. Village connectivity 7. Village Electrification 8. Communication tools and the Internet 9. Promotion of Featured Commodities	1. District/Village Government/Communit Norms in Minimizing Land Use Change 2. Government's Commitment to Financing village development 3. Land Law Cases 4. Wildlife Reserve Area Management Block 5. Integration and Synergy of village development

Table 2 depicts the categories of a sustainability index for each dimension of village development (environmental, social, economic, law and

governance) in the Bukit Rimbang Baling Wildlife Reserve Area (Riza, Zulkarnaini, dan Efriyeldi, 2019) :

Table 2. Categories of Sustainability Index

Index	Criteria
0 - 25	Very poor/ Unsustainable
>25 - 50	Poor/ Less Sustainable
>50 - 75	Good/ Moderately Sustainable
> 75 - 100	Very Good/ Sustainable

The index for each dimension has been obtained up to this step. To get the combined index of the ecological, social, economic, law and governance dimensions, the weight value of each dimension is calculated using a pairwise comparison matrix that may use the Analytic Hierarchy Process (AHP) (Budiharsono, 2018). Experts were asked to provide an assessment of the level of importance of each dimension for village development in the Wildlife reserve Area. The dimensions involved are environmental, social, economic, law and governance. The level of importance of each dimension is obtained from the opinions of experts in the field of village development. The composite index of village development in the Bukit Rimbang Baling Wildlife Reserve is formulated as follows.

$$IKPD = \sum w_i x D_i$$

Where,

w_i = Weight of each dimension

D_i = Index of each dimension

III. RESULTS

The sustainability status of village development in the ecological dimension was measured by five attributes of Green Open Space amenity resources utilization, village community awareness of the environment, an adaptation of village communities to climate change, and disaster mitigation capacity. The results of the Multidimensional Scaling (MDS) using the RAPPEMDES Program on the ecological dimension show the development

status of the villages in the Subayang River basin of Bukit Rimbang Bukit Baling Wildlife Reserve is 51.29. This means that based on the ecological

dimension, the development status of the village is moderately sustainable.

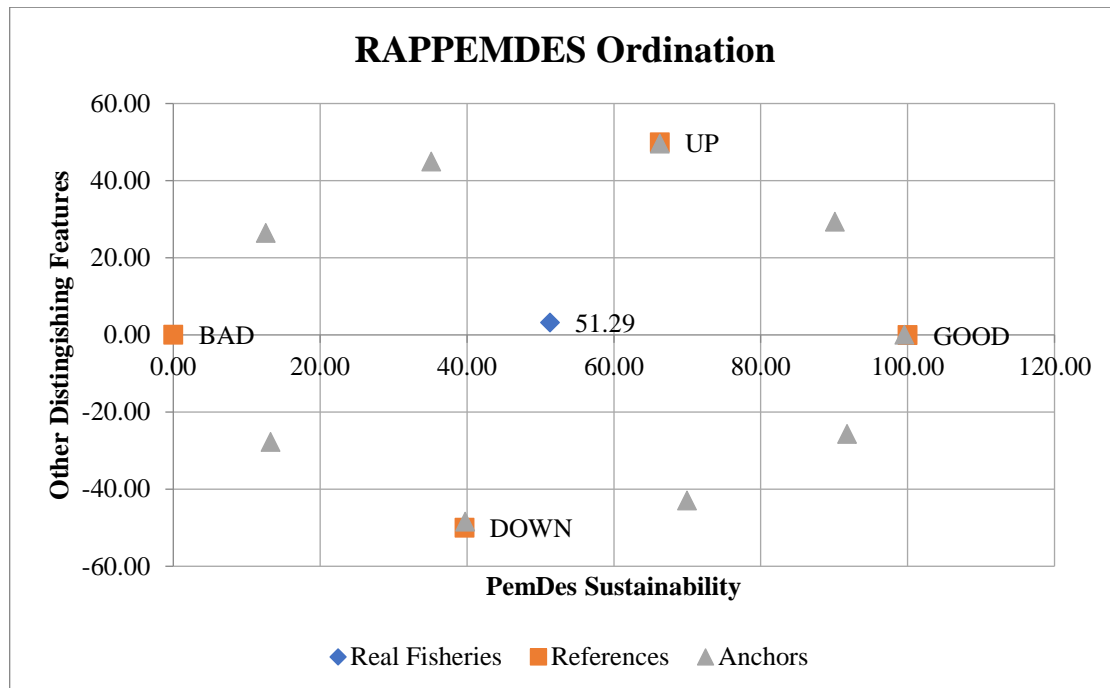


Figure 1. Sustainability Status of Village Development from the Ecological Dimension in the Villages of Subayang River Basin of Bukit Rimbang Bukit Baling Wildlife Reserve in Kampar Kiri Hulu District, Kampar Regency.

A feasibility test of the model was done to the results of the MDS through a normalization based on the stress value (S) and the coefficient of determination (R²). If the value of S < 0.25 and R² is close to 1, the model studied in this study is said to have goodness-of-fit. The Village Development Model built on the ecological dimension is categorized as very good with a Stress Value of 0.1524415 which is below 0.25. The Root Mean Square (RMS) or (R²) value is 0.9365925. This indicates that the existing variables have contributed 93.66% of the model.

Thus, the ecological dimension does not require additional attributes/variables to ensure the model built is close to the actual situation. Based on the results of the analysis of leverage of attributes, there are two leverage of attributes/variables, which are the amenity resource utilization and village community awareness of the environment. Thus, the variables of amenity resource utilization and village community awareness of the environment are sensitive variables on the ecological dimension that the improvement of these variables can improve the status of village development in the Subayang River in the Bukit Rimbang Bukit Baling Wildlife Reserve.

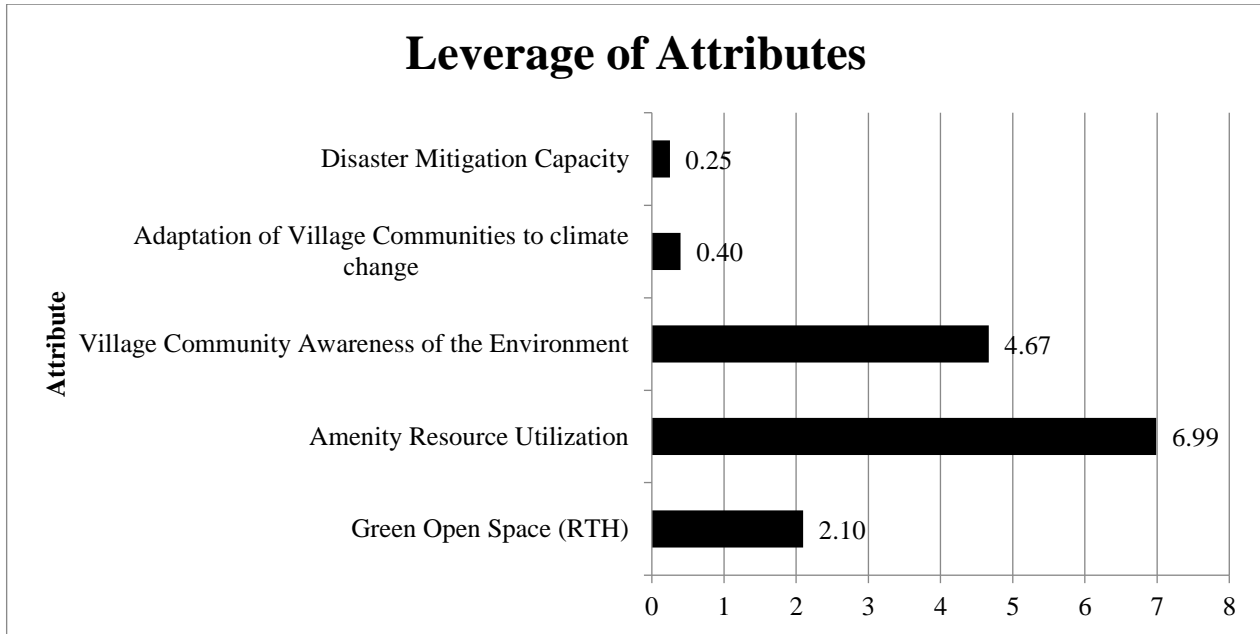


Figure 2. Results of Leverage of Attributes Analysis on Ecological Dimensions for the Villages in Subayang River Basin in the Bukit Rimbang Bukit Baling Wildlife Reserve in Kampar Kiri Hulu District, Kampar Regency.

The analysis of the sustainability status of village development on the social dimension includes seven attributes/variables. They are village community social cohesion, village community empowerment, culture and education, migration from the wildlife reserve area, utilization of cultural products, involvement of indigenous

peoples, and village community creativity. The MDS analysis using the RAPPEMDES program revealed that the sustainability status of village development on the social dimension is 43.83. This indicates the category of less sustainable.

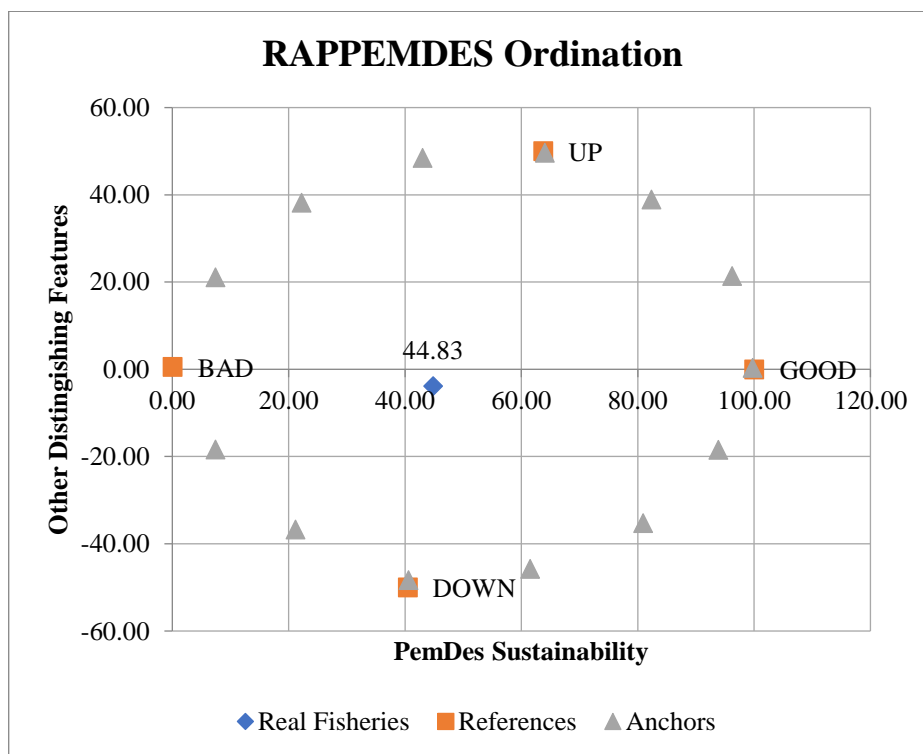


Figure 3. Sustainability Status of Village Development from the Social Dimension of Villages in Subayang River Basin in the Bukit Rimbang Bukit Baling Wildlife Reserve in Kampar Kiri Hulu District, Kampar Regency

A feasibility test of the model on the results of the MDS through a normalization was carried out based on the stress value (S) and the coefficient of determination (R^2). If the value of $S < 0.25$ and R^2 is close to 1, the model studied in this study is said to have goodness-of-fit. The village development model built for the social dimension is categorized as very good because the Stress Value of 0.1411378 is still below 0.25. The RMS (R^2) is also high, which is 0.9330270. Therefore, the existing variables have contributed 93.30% of the model. In the social dimension, it is not necessary

to add attributes/variables to make the model built closer to the actual situation.

Based on the analysis of the Leverage of Attribute on the social dimension, three main attributes have high leverage, which is the population emigration with an influence (standard error) of 12.78, cultural and educational with an influence (standard error) of 11.90, and village community empowerment with an influence (standard error) of 8.09. This means that in formulating village development policies to improve the sustainability status of the social dimension, these three attributes should be considered.

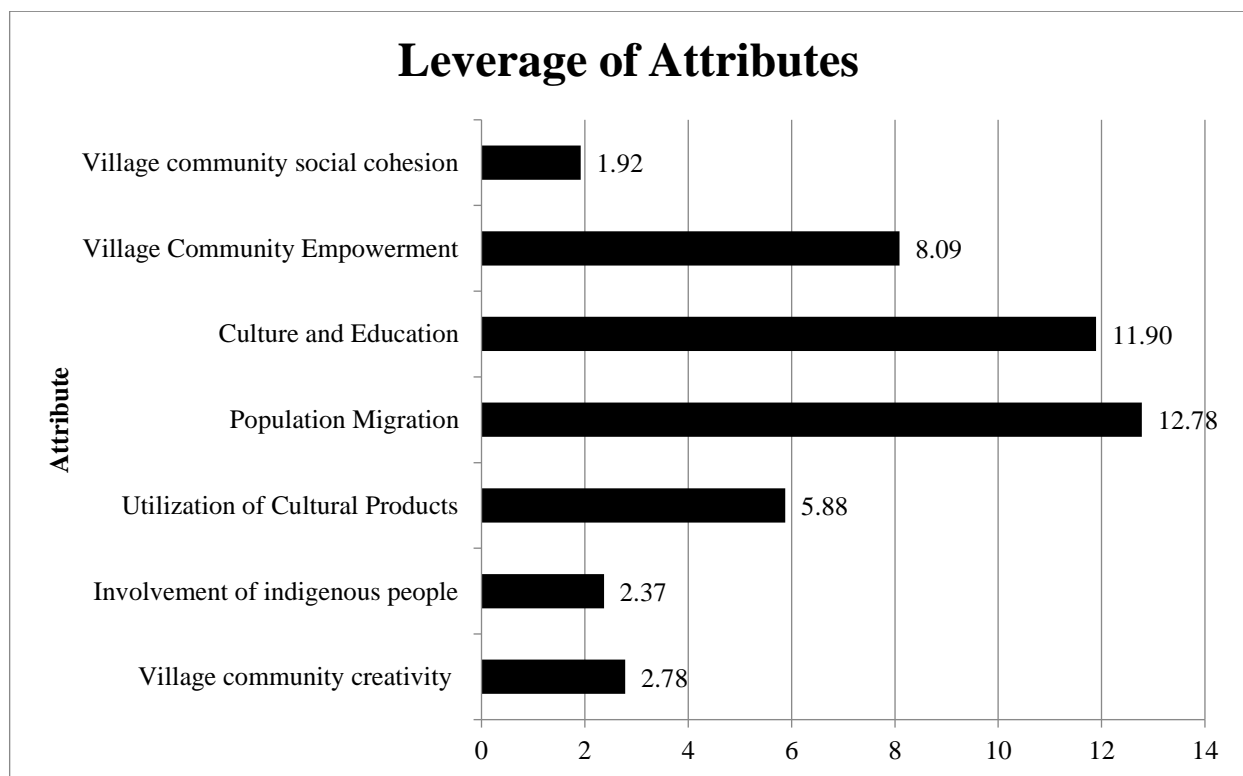


Figure 4. Leverage of Attributes Analysis on Social Dimensions for Villages in Subayang River Basin in the Bukit Rimang Bukit Baling Wildlife Reserve in Kampar Kiri Hulu District, Kampar Regency.

The analysis of the sustainability status of village development on the economic dimension includes nine attributes/variables promotion of featured commodities, communication tools and the internet, village electrification, village connectivity, rural community financial literacy level, basic facilities and infrastructure, the role of BUMDES or together with BUMDES in

developing leading commodities, the bargaining position of rural communities, and development of leading commodities. Based on the results of the MDS analysis using the RAPPEMDES program, the sustainability status of village development on the economic dimension is 30.63 in the category of less sustainable.

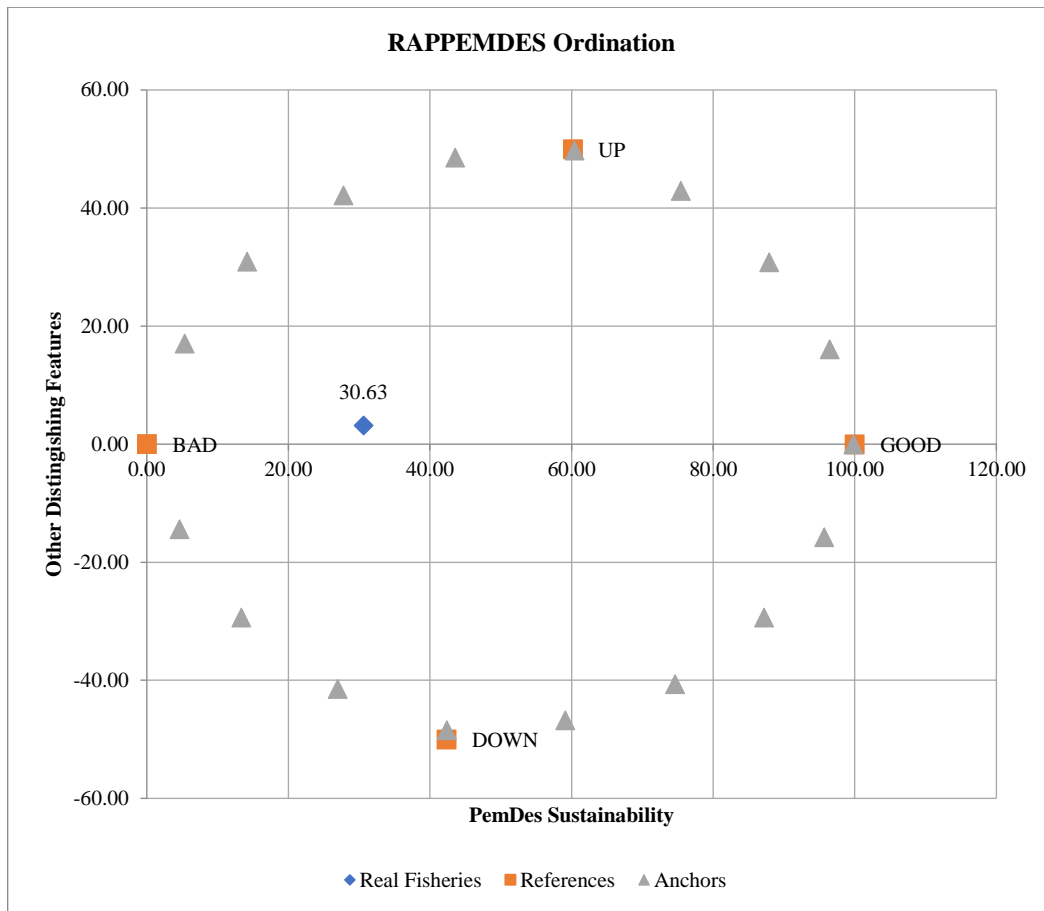


Figure 5. Sustainability Status of Village Development from the Economic Dimension of the Villages in Subayang River Basin in the Bukit Rimbang Bukit Baling Wildlife Reserve in Kampar Kiri Hulu District, Kampar Regency.

A feasibility test of the model was carried out to the results of the MDS through a normalization based on the stress value (S) and the coefficient of determination (R^2). If the value of $S < 0.25$ and R^2 is close to 1, the model studied in this study is said to have goodness-of-fit. The village development model built on the economic dimension is categorized as very good with a Stress Value of 0.1349244, which is below 0.25. The RMS (R^2) value is also high, which is 0.9499866. This describes that the existing variables have contributed 95.00% of the model. Thus, in the economic dimension, it is not necessary to add

attributes/variables to make the model built is close to the actual situation.

Based on the analysis of the Leverage of Attribute on the economic dimension, there are five main attributes with high leverage. They are the attribute of village community financial literacy level with an influence (standard error) of 5.63, the village electrification with an influence (standard error) of 5.33, the role of BUMDES or together with BUMDES with an influence (standard error) of 4.76, basic facilities and infrastructure with an influence (standard error) of 4.52, and village connectivity with an influence (standard error) of 4.38.

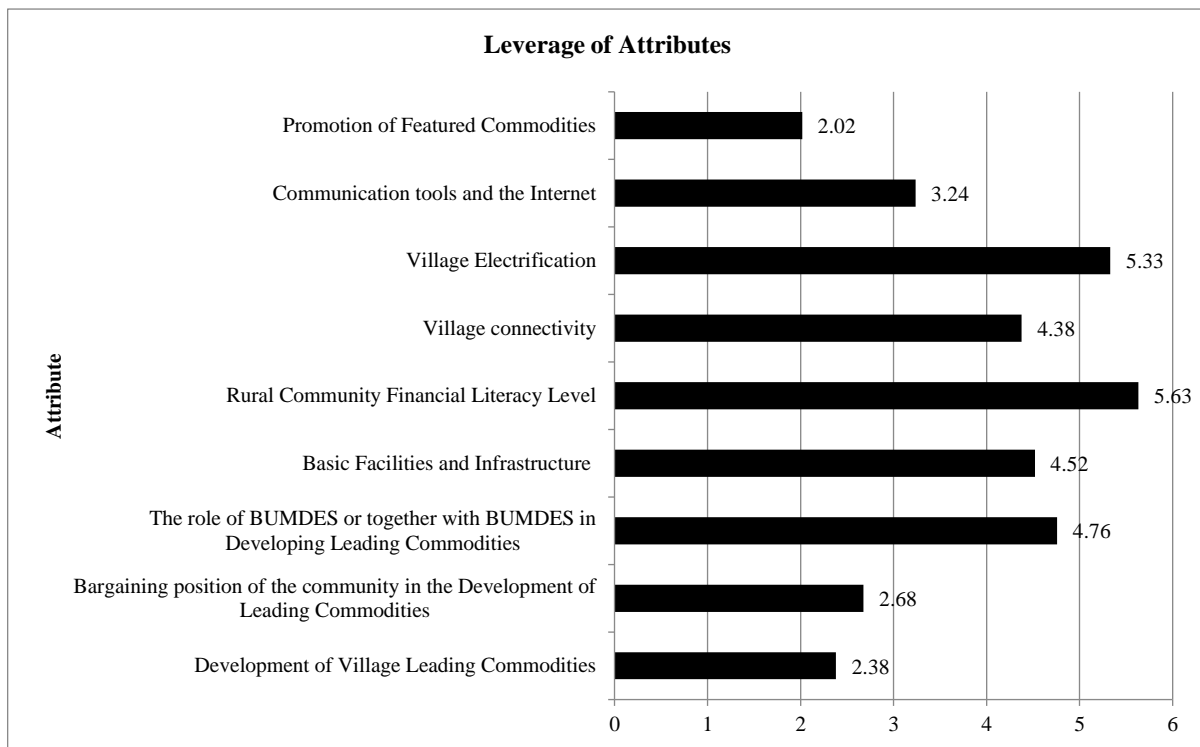


Figure 6. Analysis of Leverage of Attributes on the Economic Dimension for villages in Subayang River Basin of the Bukit Rimbang Bukit Baling Wildlife Reserve in Kampar Kiri Hulu District, Kampar Regency.

The analysis of the sustainability status of village development in the law and governance dimensions includes five attributes/variables of the integration and synergy of village development, block management of wildlife reserve areas, land law cases, government commitment to financing

village development, and policies to minimize land conversion. Based on the results of the MDS analysis using the RAPPEMDES program, the sustainability status of village development in the law and governance dimensions is 41.24, which means the status is less sustainable.

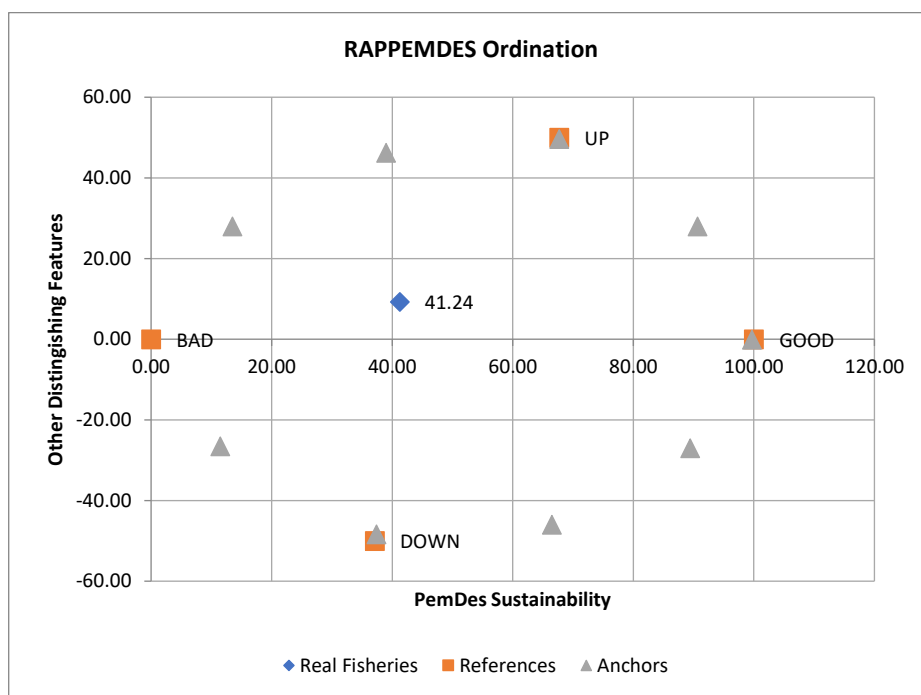


Figure 7. Sustainability Status of Village Development from Law and Governance Dimensions of Villages in Subayang River Basin in the Bukit Rimbang Bukit Baling Wildlife Reserve in Kampar Kiri Hulu District, Kampar Regency.

The results of the MDS were tested for its feasibility through a normalization based on the stress value (S) and the coefficient of determination (R²). If the value of S < 0.25 and R² is close to 1, the model studied is said to have a goodness-of-fit. The village development model built on the law and governance dimensions is categorized as very good, in which the Stress Value is 0.1533888. it is still below 0.25. The RMS (R²) value is also high, which is 0.9374396. Hence, the existing attributes/variables have contributed 93.74% of the model. Thus, it is not necessary to

add attributes/variables to the dimensions of law and governance to make the model built is close to the actual situation.

Based on the analysis of the Leverage of Attribute on the law and governance dimensions, there are four main attributes with high leverage: the land law case has an influence (standard error) of 9.90, the government's commitment to financing village development has an influence (standard error) of 9.26, the policy in minimizing land use change has an influence (standard error) of 5.75, and the integration and synergy of village development has an influence (standard error) of 4.63.

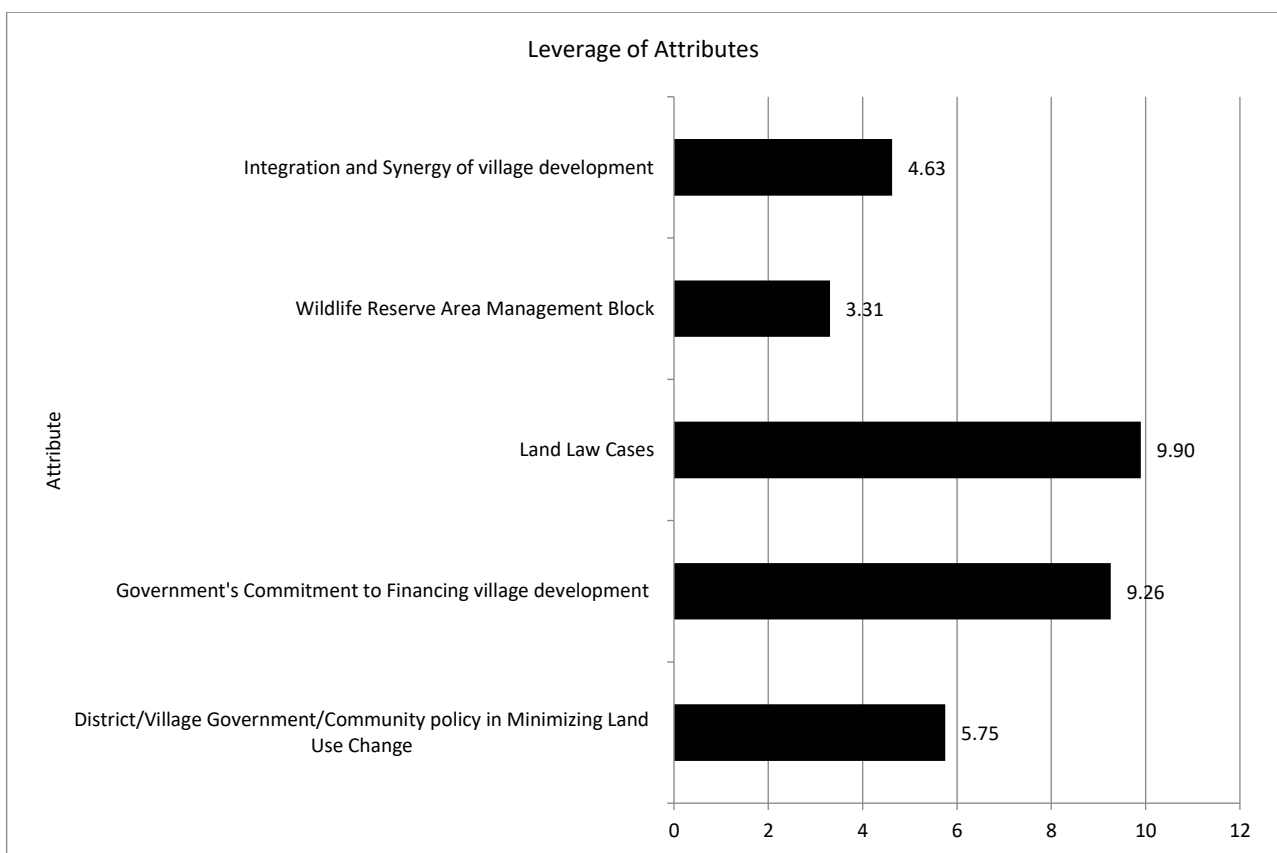


Figure 8. Analysis Results of Leverage of Attributes on Law and Governance Dimensions for Village in the Subayang River Basin in the Bukit Rimbang Bukit Baling Wildlife Reserve in Kampar Kiri Hulu District, Kampar Regency.

The sustainability status of village development in the Subayang River in the Bukit Rimbang Bukit Baling Wildlife Reserve on the ecological dimensions of social, economic, law and governance status shows the status of village development from less sustainable to moderately sustainable. Based on the kite graph, the results of

the MDS analysis show that the ecological dimension has the highest value of 51.29, followed by the social dimension of 44.83, then the law and governance dimension of 41.24, and the lowest is the economic dimension with an MDS value of 30.63.

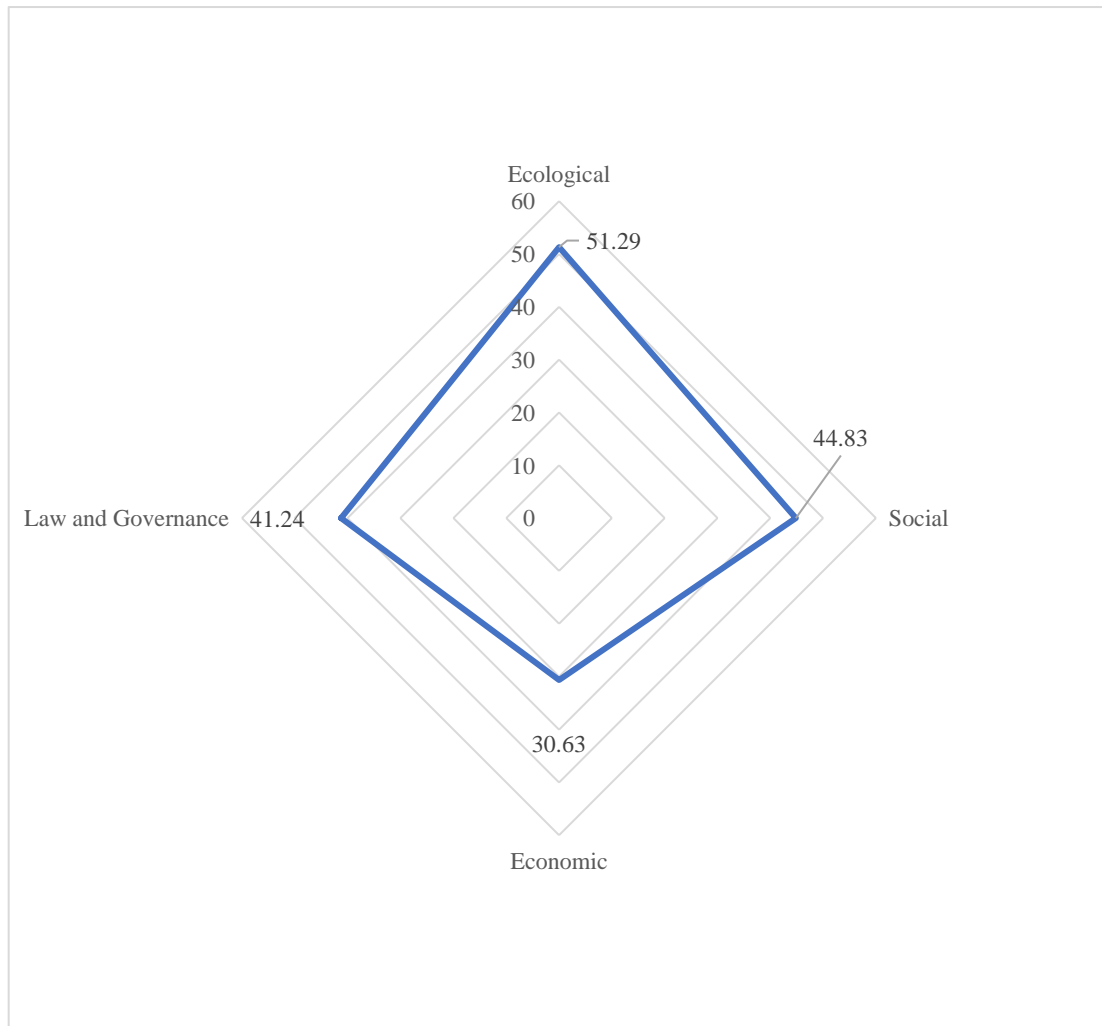


Figure 9. Kite Graph of MDS Analysis Results

Furthermore, to get the total value of the multidimensional sustainability index of village development, a weighted value for each dimension is needed. The amount of weighted value is calculated using the Analytical Hierarchy Process to determine the level of importance of each dimension based on expert opinions. The weighted value was multiplied by the MDS value for each dimension, then the value of the sustainability

index for each dimension was obtained. The total village development index was obtained when they were added up. The sum of all indexes in each dimension obtained a total village development index of 44.20. This means that the development of villages in the Subayang River in the Bukit Rimbang Bukit Baling Wildlife Reserve in Kampar Kiri Hulu District is not sustainable.

Table 3. Multidimensional Sustainability Index of Village Development

No.	Dimension	MDS	Weighted Value	Total
1.	Environment	51,29	0,4717	24,19
2.	Social	44,83	0,1479	6,63
3.	Economic	30,63	0,2179	6,68
4.	Law and Governance	41,24	0,1625	6,70
Total			1,0000	44,20

Overall, the model that has been built is categorized as good as indicated by the feasibility test of the model through the normalization test based on the

stress value (S) and the coefficient of determination (Root Mean Square-RMS/R²). If the value of S < 0.25 and R² is close to 1, the

model studied in this study is said to have goodness-of-fit. The stress value of each dimension is quite low, between 0.13 to 0.15, which is still below 0.25. The stress value from the analysis of the ecological dimensions of = 0.1524415 means that the ecological dimension model is categorized as very good. The RMS (R^2) value is also high, which is 0.9365925. It indicates that the existing variables have contributed 93.66% of the model. The stress value of the social dimension analysis is 0.1411378, meaning that the social dimension model is categorized as very good. The RMS (R^2) value is also high, at 0.9330270. It tells that the existing variables have

contributed 93.30% of the model. The stress value from the analysis of the economic dimension is 0.1349244 indicating that the economic dimension is categorized as very good. The RMS (R^2) value is also high, which is 0.9499866. Thus, the existing variables have contributed 95.00% of the model. The stress value from the analysis of the law and governance dimensions is 0.1533888. This reflects that the legal and governance dimension is categorized as very good. The RMS (R^2) value is also high with a value of 0.9374396. This indicates that the existing variables have contributed 93.74% of the model.

Table 3. Stress Value and R^2 of Each Dimension of Village Development

No.	Dimension	Stress	Square Correlation (R^2)	Description
1.	Environment	0,1524415	0,9365925	<0,25 dan > 0,8
2.	Social	0,1411378	0,9330270	<0,25 dan > 0,8
3.	Economic	0,1349244	0,9499866	<0,25 dan > 0,8
4.	Law and Governance	0,1533888	0,9374396	<0,25 dan > 0,8

RAPPEMDES is a diagnostic method with an expedited procedure. Thus, there can be errors/uncertainties caused by several factors such as errors in scoring due to lack of information, variations in scoring due to differences in assessment, and errors in data entry in the analysis. Therefore, to analyze the ordinance, a Monte Carlo analysis was carried out to determine the impact of random errors on the MDS ordinance. The results of the Monte Carlo analysis carried out for 25 repetitions (iterations) with a 95% of confidence interval on the ecological dimension showed an average result of 51.16. When compared to the results of the MDS ordinance of 51.29, the difference was 0.13. This indicates no significant difference. The results of the Monte Carlo analysis which was carried out 25 times with a 95% of

confidence interval on the social dimension showed an average result of 45.87. Compared to the MDS ordinance of 44.83, the difference was 1.04 showing no significant difference. The results of the Monte Carlo analysis which was carried out 25 times with a 95% of confidence interval on the economic dimension showed an average result of 32.95. When compared to the MDS ordinance of 30.63, the difference was 2.32 or there was no significant difference. The results of the Monte Carlo analysis carried out for 25 repetitions (iterations) with a 95% of confidence interval on the law and governance dimensions showed an average result of 41.94 when compared to the MDS ordinance of 41.24, the difference was 0.70. It indicates no significant difference.

Table 4. Comparison of Sustainability Index from MDS and Montecarlo (95% of Confidence Interval)

No.	Dimension	MDS	Montecarlo	Difference
1.	Environment	51,29	51,16	0,13
2.	Social	44,83	45,87	1,04
3.	Economic	30,63	32,95	2,32
4.	Law and Governance	41,24	41,94	0,70

IV. CONCLUSION AND SUGGESTION

The sustainability status of village development in Subayang River of Bukit Rimbang Bukit Baling Wildlife Reserve in Kampar Kiri Hulu District, Kampar Regency based on Multidimensional Scaling (MDS) analysis was 44.20. This indicates that the status of village development is less sustainable. The lowest MDS value was mainly contributed by the economic dimension, which was 30.63, followed by legal and governance dimensions of 41.24. The highest MDS value comes from the ecological dimension of 51.29 and followed by the social dimension of 44.83.

This study offers suggestions for the government. The existing status of village development in this study is categorized as less sustainable. It can be improved through a series of policies that focus on improving key attributes/variables that influence village development from the ecological, social, economic, and law and governance dimensions. Additionally, the community is expected to maintain the land quality by instilling the values of local wisdom to future generations. Further research is expected to study the amenity resource utilization and appropriate technology in village development to improve the welfare of rural communities.

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