



Volume 5	Issue 1	April (2024)	DOI: 10.47540/ijsei.v5i1.1278	Page: 31 – 41
----------	---------	--------------	-------------------------------	---------------

Sustainability of Rural Road Development: A Case Study on Woro Village Kepohbaru District Bojonegoro Region

Puji Lestari¹, Arief Rachmansyah², Anthon Efani³, Maharani Pertiwi¹

¹Department of Environmental Resource Management and Development, Universitas Brawijaya, Indonesia

²Department of Civil Engineering, University Brawijaya, Indonesia

³Department of Social Economic Fisheries, Universitas Brawijaya, Indonesia

Corresponding Author: Arief Rachmansyah; Email: arieffub@ub.ac.id

ARTICLE INFO

Keywords: Local Communities; Rural Road Development; Sustainable Development.

Received : 27 December 2023

Revised : 27 February 2024

Accepted : 18 March 2024

ABSTRACT

Road development has been a primary focus in efforts to enhance connectivity and mobility across various regions, especially in densely populated urban areas that often serve as economic hubs. While crucial for addressing mobility challenges in urban settings, it is essential to acknowledge that road development in rural areas also holds significant importance. This paper investigates the sustainability of rural road development through five dimensions of environmental, social, economic, institutional management, and law enforcement, a case study on Woro Village, Kepohbaru District, Bojonegoro Region. The quantitative research collected data through a questionnaire from 84 respondents who are members of the village community. The data analysis employed Multidimensional Scaling (MDS) using R-studio software. The result is indicated by the sustainability index of the environmental index of 83.93; the social index of 86.46; the economic index of 88.06; the institutional management index of 79.32 and the law enforcement index of 86.15. The research findings indicate rural road development has demonstrated good sustainability in various aspects, including environmental, social, economic, management institutions, and law enforcement. This confirms that efforts to build rural roads have provided sustainable and diverse positive impacts on local communities and the surrounding environment.

INTRODUCTION

Villages are important to the national economy (Arifin et al., 2020) they frequently face big economic problems (Adamowicz, 2020). These problems affect overall economic growth, public welfare, and sustainable development. Examples of these problems include limited employment opportunities (Arifin et al., 2020), reliance on agriculture without any kind of economic diversification (Aizen et al., 2019), inadequate funding and availability of financing (Arifin et al., 2020), lack of access to high-quality education and training relevant to the labor market, which hinders the village economy's ability to compete and boost productivity (Golovina et al., 2021).

The biggest issue is that access is restricted because there is insufficient road and transportation infrastructure. It may cause the economic gap

between rural and urban areas to widen and hinder rural economic progress (Sewell et al., 2019).

Village Medium-Term Development Plan (RPJMDes) is one initiative that the village is using to address problems, and it is very important. The village can plan and direct development activities in accordance with local requirements and potentials through the Village Medium-Term Development Plan (RPJMDesa), which also guides the use of available resources (Hasanati et al., 2023; Hilmawan et al., 2023)

The village government uses the Village Medium-Term Development Plan (RPJMDesa) as a guide when allocating finances, organizing development activities, and keeping track of and assessing the results of village development. (Hasanati et al., 2023). To achieve rural infrastructure development, the Village Medium-

Term Development Plan (RPJMDesa) also acts as a foundation for requests for support and assistance from the district/city administration or the federal government (Sumaila et al., 2023).

The Woro Village Regulation Number 6 of 2020 gives priority to equally distributing infrastructure development in the Woro, Ngujo, and Sidonganti hamlets, specifically through the construction of the village's main road. It outlines the implementation of development guided by the Village Medium-Term Development Plan (RPJMDesa) through consensus discussions. Building village roads is one of the top development priorities. Woro Village was able to construct village roadways in the fiscal year 2021–2022 thanks to Special Financial Assistance (BKK) to the Village for the development of the village main road, in accordance with the Bojonegoro Regent's Decree.

The self-management approach is used to carry out the village road improvement program. Starting at point 0, which is east of the village on the boundary with Bumirejo Village, the road construction goes via Woro Hamlet and connects to the Public Major Road of the Subdistrict (PUK). From there, it continues to the major road that connects Sidonganti Hamlet to the village. Since Sidonganti Hamlet is located in the western portion of the hamlet, this road construction mostly goes through rural areas with few settlements.

In an effort to improve connection and transportation across different regions—particularly in densely populated urban centers that frequently function as economic hubs—road building has been the main focus. Road construction is prioritized in metropolitan areas since it is believed that large traffic volumes or a high number of cars require sufficient transportation infrastructure (Qin et al., 2020). Road development in rural areas is important, but it's also important to recognize that it's necessary for addressing mobility issues in urban settings.

In addition to being vital for transportation, rural roads are also essential for fostering social cohesion and economic development in the agricultural industry (Munday et al., 2023). Village Roads, which link farms, neighborhood marketplaces, and community facilities, frequently become the vitality of a village. Thus, building new roads in rural regions offers additional potential to

improve local sustainability and well-being in addition to facilitating physical access (Aggarwal, 2018).

Globally, rural development is essential to improving the standard of living for people living in rural areas, especially when it comes to basic infrastructure like rural roads. However, the importance of sustainable development issues has grown in light of the growing global challenges. Research is required to address this, taking into account the consequences of climate change, environmental difficulties, social issues, horizontal obstacles, and the rise in criminal activity that is progressively destroying the infrastructure systems that are currently in place. Researchers are taking a novel method to answer the question of how to assess the sustainability of rural road development. Numerous research projects have been carried out to bolster sustainable development as the cornerstone of eco-friendly laws and procedures. Among these are the instances in that women participate in decision-making (Wahyuni et al., 2023), safeguarding the environment with wastewater (Mukwarami & Poll, 2023), preventing urban collapse and enhancing its quality (Moita et al., 2021) and undertaking actions like forest management to protect the environment (Gautam et al., 2021; Paudel & Paudel, 2021), establish a connection with sustainable development (Tuwu & Arsyad, 2021), farming (Paudel & Paudel, 2021; Rachmansyah et al., 2023) sustainability (Adeoye et al., 2021), infrastructure sustainability (Rachmansyah et al., 2019), replenishable energy (Serag & Adil, 2021)

Research on the sustainability evaluation of rural road development is relatively new since it considers more than just one aspect of road construction, as was done in earlier environmental studies (Bella et al., 2019; Edward et al., 2019; Eremina, 2018; Giunta, 2023). Social factors include choices about education, gender roles, and young employment (Shimamura et al., 2023), road safety (Gaber et al., 2023) as well as local economy (Wan et al., 2022), accessibility (Nissanka & Gunasekara, 2023), economy of agriculture (Lu et al., 2023) industry or sector (Pillabhotla et al., 2023), commerce, travel, and logistics (Saidi et al., 2020). The five pillars of sustainable development namely environmental, social, economic, institutional management, and law enforcement are

presented in this study as a more all-encompassing strategy. The goal is to give decision-makers for sustainable development in the future a more comprehensive and pertinent understanding. This innovation guarantees that, in this increasingly complicated era, the research will provide stakeholders with a solid basis upon which to establish sustainable policies in the development of rural roads.

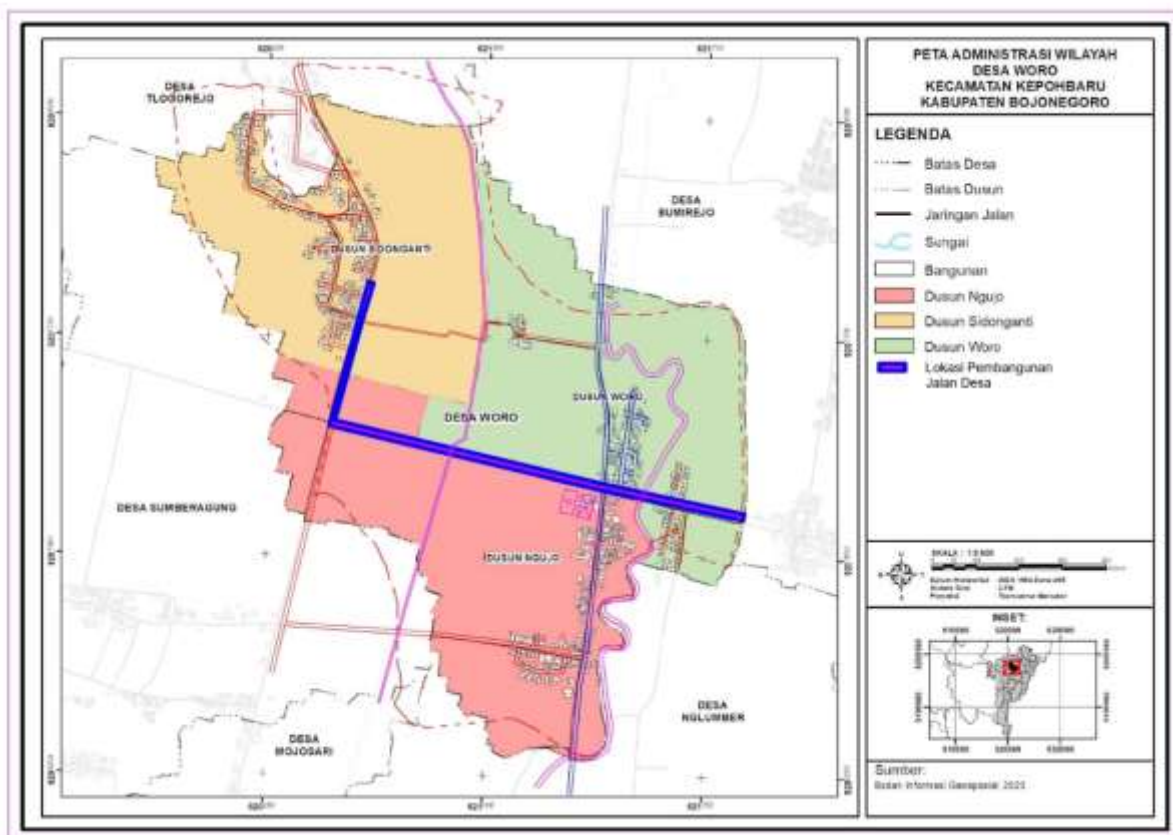
This article will examine the sustainability of giving road development in rural areas particular attention, based on the description provided above. Improved road infrastructure in rural areas can benefit the community in many ways, including increased physical mobility, social cohesion among the rural people, and stimulation of local economic growth. To assess the sustainability of road development, this study will examine the environmental, social, institutional, economic, and

legal elements of the Woro Rural Road construction site in Kepohbaru Subdistrict, Bojonegoro Regency.

MATERIALS AND METHODS

The research was conducted in the Woro Village with 1.738 m road development. Quantitative method with observation, a review of the literature, and the distribution of questionnaires to 84 respondents whose answers were derived using the Slovin formula were used to gather the data for the study (Iqbal et al., 2024) to two hamlets, Sidonganti Hamlet, and Woro Hamlet, within the community. Measurement of environmental, social, economic, institutional management, and law enforcement. Using R-studio and the Multidimensional Scaling (MDS) analytic approach, inferential analysis is the analysis method used.

Figure 1. Research Location Map Source of Rural Road Development on Woro Village



In this research, Rapfish analysis was carried out through several stages as follows:

1. Determining dimensions, reviewing attributes, and defining program units program unit that will be analyzed. Data and information were
2. Conducting attribute assessment/scoring by weighting through pairwise comparison between dimensions based on the scale of

obtained through literature studies and in-depth interviews with experts.

importance scale. Scoring involved respondents in the community of Woro Village.

3. Analyze the score value of each attribute with MDS by conducting ordination analysis using Program R software (open software). In ordination analysis, the sustainability status of each program is simulated into a point that is placed in a measurable order and anchored by reference points, based on a scale of good/good and bad/bad. The result of the analysis of each dimension will show the level of sustainability status of that dimension. After each dimension has been analyzed, then proceed with the analysis of the level of sustainability between dimensions, which can be done and visualized through a kite diagram.
4. Conduct sensitivity analysis (leverage analysis) and Monte Carlo analysis. Leverage analysis is used to determine sensitive attributes, also known as sustainability leverage factors. Monte Carlo analysis is used to anticipate aspects of uncertainty, and to account for uncertainty by evaluating the impact of random errors due to lack of information the influence of variation in scores due to differences in opinion or judgment, data entry errors (including missing data), process stability of the iterative MDS analysis process, and the high stress (incomplete convergence) conducted through a simulation approach.

RESULTS AND DISCUSSION

Index of Sustainability

The research area's rural road development's sustainability is assessed using sustainability indicators developed from expert consultations and literature reviews of the village's 18 Sustainable Development Goals (SDGs). These indicators, which total up to 22, include: 5 indicators of environmental dimensions, 5 indicators of social dimensions, 4 indicators of economic dimensions, 4 indicators of institutional management dimensions, and 4 indicators of law enforcement dimensions (Masuda et al., 2022).

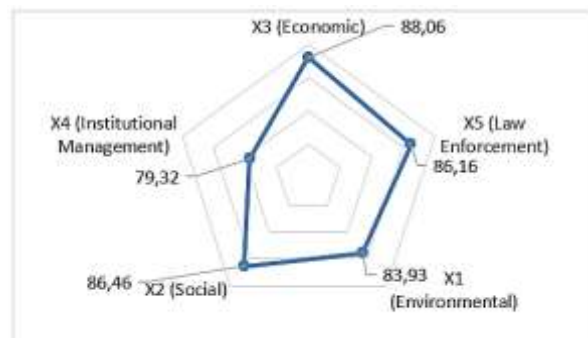
The R-studio software is utilized to obtain the leverage factors and ordination (sustainability index) for every category of rural road development. According to (Kavanagh & Pitcher, 2004), The sustainability index is presented in Table 1 below.

Table 1. Sustainable Index

Sustainable Index	Sustainable Status
0-25	Unsustainable
26-50	Less Sustainable
51-75	Quite Sustainable
76-100	Sustainable

In this research, the sustainability status of Village Road Development in Woro Village, Kepohbaru Subdistrict, Bojonegoro Regency is reviewed from five dimensions of sustainable development, namely the environmental, social, institutional, and law enforcement dimensions. Each dimension has several attributes, namely 5 attributes for the environmental and social dimensions, while the social, institutional, and law enforcement dimensions have 4 attributes. The kite diagram (Figure 2) shows the sustainability scores as follows: environmental dimension 83.93; social dimension 86.46; social dimension 88.06; institutional dimension 79.32; and law enforcement dimension 86.16. Based on Table 1, the resulting index value shows that all dimensions are in good or sustainable status because they are in the range of 76-100. All dimensions have been assessed as very good, so the challenge is how to maintain the sustainability of all dimensions for the enjoyment of current and future generations.

Figure 2. Sustainability Index of Rural Road Development



Based on Table 1, the resulting index value of the 5 dimensions through Rapfish shows the "sustainable" category, because it is in the range of 76-100. All dimensions good index or sustainability of rural road development. The five dimensions include environmental, social, economic, institutional management, and law enforcement. The high level of sustainability of the rural road program confirms previous research conducted by

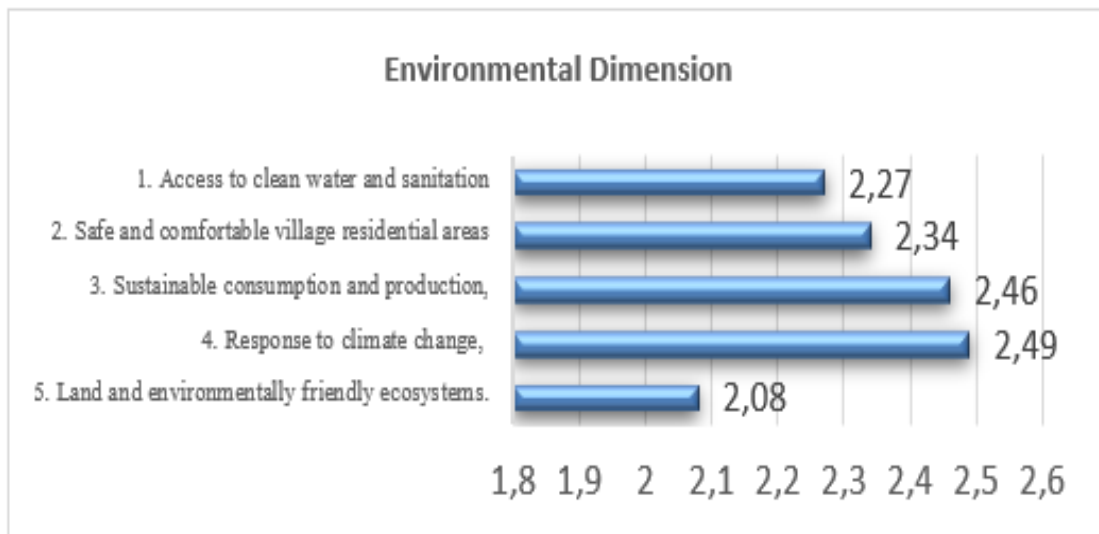
(Safiullin et al., 2020) which states that one of the supporters of the regional economic system is infrastructure development; (Yu et al., 2023) suggests the transportation infrastructure increased economic growth; (Moon et al., 2023) transport expenditure and economic growth can reduce the ecological footprint, while urbanization, mobile use, and electricity consumption increase it both in the short and long run. Among these five aspects, the economic aspect has the greatest influence because it is directly related to economic growth. Economic growth is considered a benchmark for successful development. Economic aspects also include equitable development and distribution of economic benefits such as supporting the creation of jobs, competitiveness, and investment to reduce the large gap between hamlets in rural areas. Evaluation of road development from the most important economic aspect, but must still be supported by other aspects, namely environmental, social, institutional, and law enforcement so that the

ecosystem is maintained and sustainable development is realized.

Environmental Dimension

The results of the MDS analysis show that the environmental dimension has a sustainable status with a sustainability index value of 83.93. The environmental sustainability index value is influenced by 5 attributes as the basis for sustainability assessment. These attributes are (1) Access to clean water and sanitation, (2) Safe and comfortable village residential areas, (3) Sustainable consumption and production, (4) Response to climate change, and (5) Land and environmentally friendly ecosystems. Based on Figure 2, it can be seen that the most sensitive attribute that affects the sustainability of this dimension is (4) Response to climate change, followed by (3) Sustainable consumption and production, so if you want to maintain or increase the value of sustainability, you must pay more attention to these 2 attributes so that the sustainability status does not decrease in the future.

Figure 3. Leverage Attributes of Environmental Dimension



Sustainability is a condition or status in which human activities can take place in harmony with the environment and society without compromising the needs of future generations. In this context, there are several sensitive attributes that significantly affect the sustainability of this dimension, and the two main aspects that need special attention are Climate Change Response and Sustainable Consumption and Production.

Climate change is a global challenge that has serious consequences for sustainability. Extreme

weather events, rising global temperatures, and changing rainfall patterns can affect ecosystems and cause environmental instability. Sustainability in this dimension requires responding to climate change. Adaptation and mitigation initiatives need to be integrated across sectors, including energy, transportation, and agriculture.

Based on data from the 2023 profile of Woro Village, out of 808 families in Woro Village, 695 households use village piped water and 113 households use well water. It can be concluded that

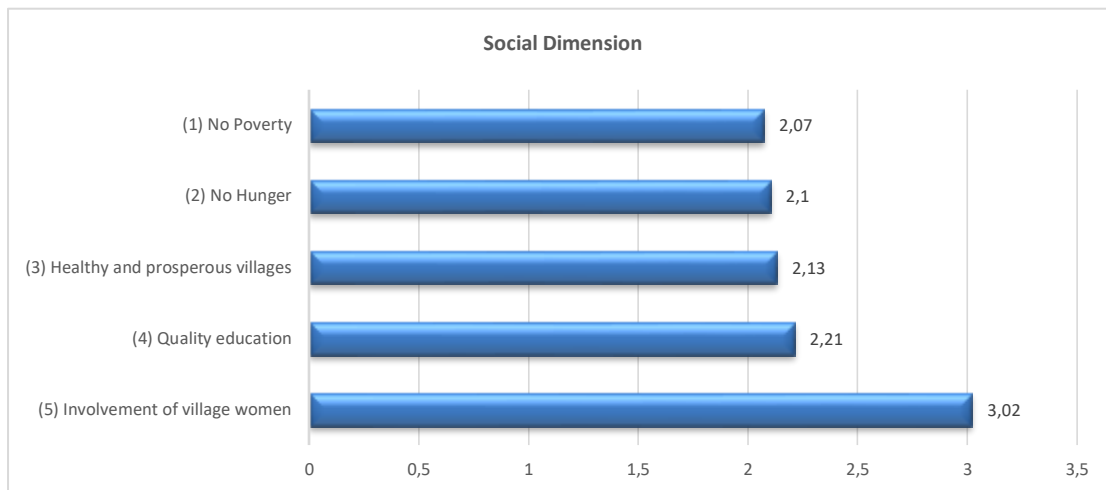
the needs of the people of Woro Village for clean water can be fulfilled 100%. This is in accordance with research conducted by (Manisha et al., 2023; Patra et al., 2023) that sanitation development and clean water availability are influenced by good access and providing access to basic amenities such as safe drinking water, waste management, drainage systems and bio-compost pits in households.

Road construction can improve drainage systems and reduce the risk of flooding, thus helping water management to be better. Good water management can support the fulfillment of needs in the agricultural sector so as to achieve sustainable consumption and production. This is in accordance with research conducted by (Rahman et al., 2022) that adaptation affects the environment, especially in the field of food security.

Social Dimension

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 necessary strategy is to maintain its sustainability. The sustainability index value of the social dimension is influenced by 5 attributes as the basis for sustainability assessment. These attributes are (1) No Poverty, (2) No Hunger, (3) Healthy and prosperous villages, (4) Quality education, and (5) Involvement of village women. Figure 4. is the result of the leverage of the social dimension, in the figure it can be seen that the attribute of village women's involvement is a sensitive attribute that can be used to maintain the sustainability of the social dimension.

Figure 4. Leverage Attributes of Social Dimension



Road development also has an impact on gender equality and women's involvement in the village. Road development can improve the accessibility and mobility of women in the village. With good roads, women can more easily access health services, education, and markets. This can reduce geographical barriers that often limit women's participation in economic and social activities. Good roads can open up new employment opportunities for women, both directly and indirectly. For example, they can become involved in the transportation, trade, or tourism sectors that may develop as a result of improved accessibility. With better access to markets, women can engage in micro and small enterprises or expand their businesses. Better accessibility to schools can increase women's participation in education. With

good roads, women and girls can more easily access schools, reducing barriers related to safety and travel time. Women are often responsible for the health care of family members.

Good roads can improve access to health facilities, allowing women to easily take their families to health centers or obtain necessary health services. Road construction that involves women's participation in planning and decision-making can strengthen their role and contribution to the development process. This creates opportunities to increase women's involvement in decision-making at the local level.

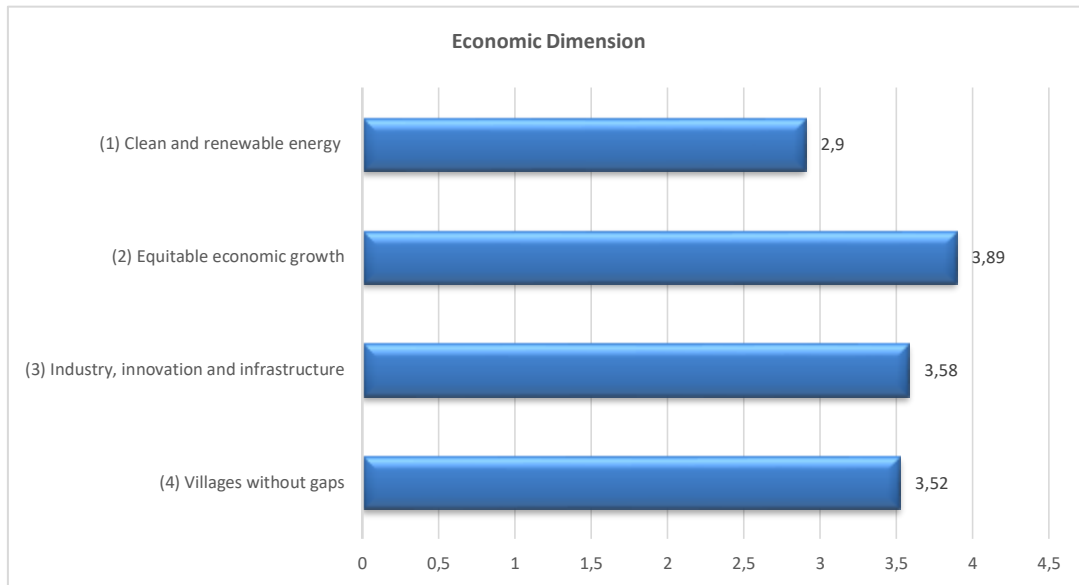
Economic Dimension

The results of the MDS analysis show that the economic dimension has a sustainable status with a sustainability index value of 88.06. Good

sustainability status needs to be maintained so that knowledge is needed about sensitive attributes in improving sustainability status through Leverage analysis. The economic sustainability index value is influenced by 4 attributes as the basis for sustainability assessment. These attributes are (1) Clean and renewable energy, (2) Equitable economic growth, (3) Industry, innovation, and

infrastructure, (4) Villages without gaps. Based on the results of the Leverage test in Figure 5, it is very clear that equitable economic growth is the most sensitive factor that needs to be improved to improve the sustainability status of the economic dimension in the construction of rural roads in Woro Village, Bojonegoro Regency.

Figure 5. Leverage Attributes of the Economic Dimension



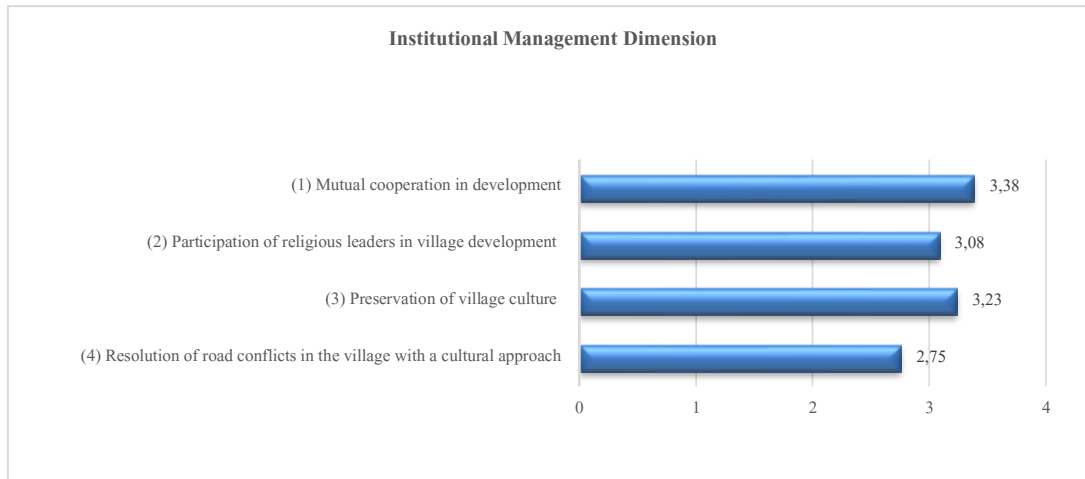
Good road access enables businesses to run more efficiently, reduces logistics costs and speeds up road distribution and increases labor mobility, facilitates local and national trade and encourages new types of business innovation and private investment. Villages with good road infrastructure attract investment and trade, thereby increasing competitiveness, economic attractiveness, and reducing regional disparities in rural areas and realizing economic equity across villages.

Institutional Management Dimension

The results of the MDS analysis show that the institutional management dimension has a sustainable status with a sustainability index value of 79.32. This index value is very good so it needs to be maintained and improved to remain in a sustainable status. The institutional sustainability index value is influenced by 4 attributes as the basis

for sustainability assessment. These attributes are (1) Mutual cooperation in development, (2) Participation of religious leaders in village development, (3) Preservation of village culture (4) Resolution of road conflicts in the village with a cultural approach, namely compromise. Based on Figure 6 below, it can be seen that there is one attribute that is most sensitive in influencing the sustainability of the institutional dimension of rural road development efforts in Woro Village, Kepohbaru Subdistrict, Bojonegoro Regency, namely (1) Mutual cooperation in development. This sensitive attribute, if improved, will be able to increase or maintain sustainability in this dimension.

Figure 6. Leverage Attributes of Institutional Management Dimension



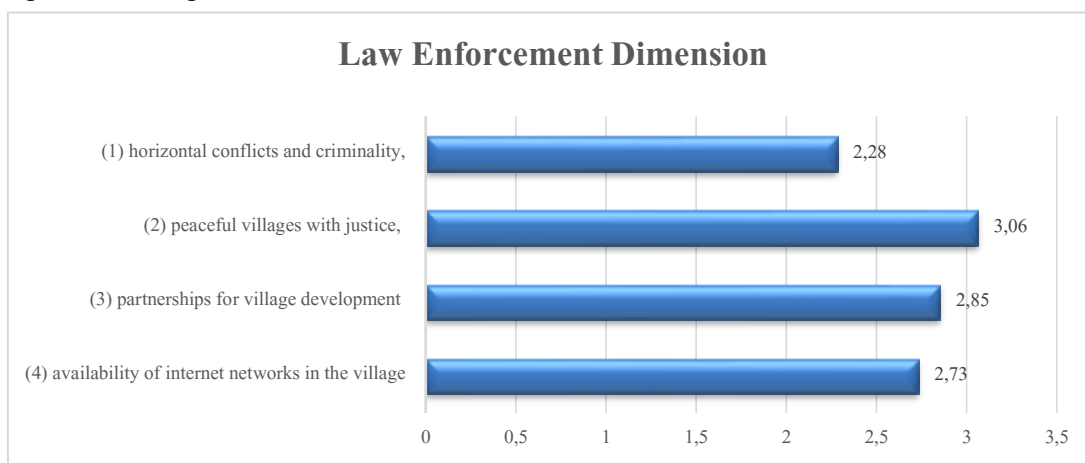
Gotong Royong or mutual cooperation in development is a cultural concept in Indonesia that describes the spirit of *gotong royong* or joint cooperation to achieve a common goal. Village road construction can strengthen the spirit of *gotong royong* among local communities. A road construction process that involves the active participation of villagers can increase the sense of togetherness and solidarity. Village road construction involving *gotong royong* can increase community participation in decision-making related to the project. The community feels ownership of the project and feels responsible for the continuity and maintenance of the road. Village road development can encourage the establishment or strengthening of local institutions, such as *gotong royong* groups or village institutions responsible for road maintenance. These institutions can provide a

forum for coordination and collaboration among residents and foster a sense of shared responsibility for the infrastructure. The community feels that they have an active role in maintaining and caring for the road as a shared asset.

Law Enforcement Dimension

The results of the MDS analysis show that the Law Enforcement dimension has a sustainable status with a sustainability index value of 86.15. This sustainability index value is influenced by 4 attributes, namely (1) horizontal conflicts and criminality, (2) peaceful villages with justice, (3) partnerships for village development, and (4) availability of internet networks in the village. After the Leverage test, it can be seen in Figure 7. that the most sensitive attribute is (2) Village peace and justice.

Figure 7. Leverage Attributes of Law Enforcement Dimension



The attributes of peaceful villages due to rural road construction includes attention to law enforcement, community empowerment, and

conflict management. A concrete example is that village road construction can improve accessibility for law enforcement officials, enabling them to

respond more quickly to emergencies and carry out law enforcement tasks more effectively. Accessibility can also improve security and order in the area, helping to reduce crime rates and increase people's sense of security. Road construction facilitates cooperation with external parties, including the police, government agencies, and other legal institutions, to improve law enforcement in the village. Environmentally friendly and well-supervised village roads can help in addressing environmental crimes, such as illegal logging or pollution.

CONCLUSION

Village road development has an important role in overcoming various problems in Woro Village, Kepohbaru District, Bojonegoro Regency. Before the development of village roads, poor accessibility resulted in several things, namely a low economy, problems with the welfare of the population, and poverty. With the development of roads, there has been a significant improvement in several aspects, namely environmental, social, economic, institutional management, and law enforcement in the village so development needs to be carried out sustainably. This is shown by the sustainability index for village road construction which is of good value or sustainable with a sustainability index value of 79.32 – 88.06. The results of the analysis in the study show that road development in Woro Village, Kepohbaru Subdistrict, Bojonegoro Regency is of good value and sustainable so that continuing the next village road development program can be done by maintaining the sustainability of all aspects in the village development pillars in accordance with the 18 points of the Village SDG's and can be enjoyed by current and future generations.

REFERENCES

- Adamowicz, M. (2020). *The "Smart Village" as a Way to Achieve Sustainable Development in Rural Areas of Poland*.
- Adeoye, A. S., Oluwole Olalekan Oke, & Michael Omokhaye Smart. (2021). Relevance of Farmers' Cultivation of *Jatropha* Plant for Sustainable Environment in Lagelu Community Oyo State. *Indonesian Journal of Social and Environmental Issues (IJSEI)*, 2(1), 14-21.
- Aggarwal, S. (2018). Do rural roads create pathways out of poverty? Evidence from India. *Journal of Development Economics*, 133, 375–395.
- Aizen, M. A., Aguiar, S., Biesmeijer, J. C., Garibaldi, L. A., Inouye, D. W., Jung, C., Martins, D. J., Medel, R., Morales, C. L., Ngo, H., Pauw, A., Paxton, R. J., Sáez, A., & Seymour, C. L. (2019). Global agricultural productivity is threatened by increasing pollinator dependence without a parallel increase in crop diversification. *Global Change Biology*, 25(10), 3516–3527.
- Arifin, BondiVillage fund, village-owned-enterprises, and employment: E. from I., Wicaksono, E., Tenrini, R., Wardhana, I. W., Setiawan, H., Sofia, D., Solikin, A., Suhendra, M., Acwin, H., Ariutama, G. A., Djunaedi, P., & Arif, B. R. (2020). Village fund, village-owned enterprises, and employment: Evidence from Indonesia. *Journal of Rural Studies*, 79.
- Arifin, B., Tenrini, R., Wicaksono, E., Rahman, A., Wardhana, I., Setiawan, H., & Damayanti, S. (2020). Labour Standards in the Global Supply Chain: Village Fund and Labour Working Hours in Indonesia Public Policy View project BUM Desa View project Labour Standards in the Global Supply Chain; Village Fund and Labour Working Hours in Indonesia. *Int. J Sup. Chain. Mgt*, 9(5), 1189–1194.
- Bella, F., Llopis-castelló, D., Camacho, F. J., Nobili, F., Bella, F., Camacho-, F. J., & Vito, V. (2019). ScienceDirect ScienceDirect Environmental Effects of Road Geometric and Operational Features Environmental Effects of Road Geometric and Operational Features. *Transportation Research Procedia*, 37(September 2018), 385–392.
- Edward, J., Wennström, P., Bhattarai, A., Joslyn, A., Eriksen, S., Sillmann, J., & Asia, S. (2019). Asking the right questions in adaptation research and practice: Seeing beyond climate impacts in rural Nepal. *Environmental Science and Policy*, 94(September 2018), 227–236.
- Eremina, D. (2018). The impact of transport infrastructure on ecological status of arable

- land in Western Siberia. *MATEC Web of Conferences*, 170.
- Gaber, M., Diab, A., Othman, A., & Wahaballa, A. M. (2023). *Analysis and Modeling of Rural Roads Traffic Safety Data*. 3(1).
- Gautam, S., Timilsina, S., & Shrestha, M. (2021). The Effects of Forest Management Activities on Genetic Diversity of Forest Trees. *Indonesian Journal of Social and Environmental Issues (IJSEI)*, 2(2), 110-118.
- Giunta, M. (2023). Sustainable Practices in Road Constructions: Estimation and Mitigation of Impact on Air Quality. *Transportation Research Procedia*, 69(Tis 2022), 139–146.
- Golovina, S., Smirnova, L., & Ruchkin, A. (2021). Education Is an Important Factor of Human Capital Development in Rural Territories. *E3S Web of Conferences*, 282.
- Hasanati, S., Rijanta, R., & Pitoyo, A. J. (2023). Rural planning study based on RPJMDes in Jepitu Village, Gunung Kidul Regency, Indonesia. *IOP Conference Series: Earth and Environmental Science*, 1190(1).
- Hilmawan, R., Aprianti, Y., Thi, D., Vo, H., Yudaruddin, R., & Fenty, R. (2023). Rural development from village funds, village-owned enterprises, and village original income. *Journal of Open Innovation: Technology, Market, and Complexity*, 9(4), 100159.
- Iqbal, M., Siddique, F., & Biswas, D. (2024). *E-waste Estimation: A case study of Shahjalal University of*.
- Kavanagh, P., & Pitcher, T. J. (2004). *Implementing Microsoft Excel software for Rapfish: a technique for the rapid appraisal of fisheries status*. 12(2).
- Lu, H., Zhao, P., Hu, H., Yan, J., & Chen, X. (2023). Exploring the heterogeneous impact of road infrastructure on rural residents' income: Evidence from nationwide panel data in China. *Transport Policy*, 134, 155–166.
- Manisha, M., Verma, K., Ramesh, N., Anirudha, T. P., & Santrupt, R. M. (2023). Science of the Total Environment Water, sanitation, and hygiene implications of large-scale recycling of treated municipal wastewater in semi-arid regions. *Science of the Total Environment*, 904(May), 166631.
- Masuda, H., Kawakubo, S., Okitasari, M., & Morita, K. (2022). Exploring the role of local governments as intermediaries to facilitate partnerships for the Sustainable Development Goals. *Sustainable Cities and Society*, 82 (September 2021), 103883.
- Moita, S., Darmin Tuwu, & Allan Darmawan. (2021). Strategy for Prevention and Quality Improvement of Urban Slumps Based on Community Empowerment. *Indonesian Journal of Social and Environmental Issues (IJSEI)*, 2(2), 98-109.
- Moon, M., Pal, S., & Ashiq, M. (2023). Innovation and Green Development Towards sustainable development: The impact of transport infrastructure expenditure on the ecological footprint in India. *Innovation and Green Development*, 2(2), 100037.
- Mukwarami, S., & van der Poll, H. M. van der P. (2023). Environmental Management Expenditure and Fiscal Sustainability of South African Urban Municipalities: A Panel Data Model. *Indonesian Journal of Social and Environmental Issues (IJSEI)*, 4(2), 171-183.
- Munday, M., Reynolds, L., & Roberts, A. (2023). Re-appraising 'in-process' benefits of strategic infrastructure improvements: Capturing the unexpected socio-economic impacts for lagging regions. *Transport Policy*, 134(February), 119–127.
- Nissanka, L. A., & Gunasekara, K. A. (2023). *Management of social sustainability and quality aspects of rural road construction in Sri Lanka*. July, 753–766.
- Patra, P., Roy, A., Ghosh, A., & Malik, P. (2023). *Socio-economic impact on the availability of basic amenities: a comparative analysis of villages of hilly states, India*. 37–58.
- Paudel, Y., & Paudel, A. . (2021). Contribution of Forestry in Economy and Employment Generation in Nepal. *Indonesian Journal of Social and Environmental Issues (IJSEI)*, 2(2), 188-195.
- Pillabhotla, H., Baylis, K., & Venkateswaran, G. (2023). Rural Roads and Local Agro-Firm Development: Evidence from India. *Agriculture & Applied Economics Association*.
- Qin, X., Li, Y., Lu, Z., & Pan, W. (2020). What

- makes better village economic development in traditional agricultural areas of China? Evidence from 338 villages. *Habitat International*, 106(102286).
- Rachmansyah, A., Afifatur, R., & Amin, S. L. (2023). Evaluation of environmental carrying capacity based on land capability for agriculture development in the Melolo Transmigration Area, East Sumba Evaluation of environmental carrying capacity based on land capability for agriculture development in the Mel. *Earth and Environment*. IOP Conf. Ser.: Earth Environ. Sci. 1239 012036.
- Rachmansyah, A., Hadi, A., & Hasyim, A. W. (2019). *Sustainability Analysis of Industrial Estate Development in the Gresik*. 10(08), 12–29.
- Rahman, M. S., Huang, W., Toiba, H., & Efani, A. (2022). Does adaptation to climate change promote household food security ? Insights from Indonesian fishermen. *International Journal of Sustainable Development & World Ecology*, 29(7), 611–624.
- Safiullin, M. R., Kadyrov, A. R., & Galeeva, G. M. (2020). *Infrastructure Support For The Development Of Regional Economic System*. 843.
- Saidi, S., Mani, V., Mefteh, H., Shahbaz, M., & Akhtar, P. (2020). Dynamic linkages between transport, logistics, foreign direct Investment, and economic growth: Empirical evidence from developing countries. *Transportation Research Part A: Policy and Practice*, 141, 277–293.
- Serag, S., & Echchelh Adil. (2021). Environmental Physics Study of Natural Renewable Energy Resources in Socotra, Yemen. *Indonesian Journal of Social and Environmental Issues (IJSEI)*, 2(1), 31-38.
- Sewell, S. J., Desai, S. A., Mutsaa, E., & Lottering, R. T. (2019). A comparative study of community perceptions regarding the role of roads as a poverty alleviation strategy in rural areas. *Journal of Rural Studies*, Volume 71, 73–84.
- Shimamura, Y., Shimizutani, S., Yamada, E., & Yamada, H. (2023). The Gendered Impact of Rural Road Improvement on Schooling Decisions and Youth Employment in Morocco The Gendered Impact of Rural Road Improvement on Schooling Decisions and Youth Employment in Morocco. *The Journal of Development Studies*, 59(3), 413–429.
- Sumaila, A., Naiim, M., & Cuthbert, K. (2023). Heliyon Grassroots stakeholders ' perception of participation in the Medium-Term Development Plan of District Assemblies in Ghana: The case of Sawla-Tuna-Kalba District. *Heliyon*, 9(8), e19178.
- Tuwu, D., Supriyono, & Arsyad, M. (2021). Farmer Adaptation Strategy to Their Environment in the Village of Makoro Binongko Wakatobi. *Indonesian Journal of Social and Environmental Issues (IJSEI)*, 2(1), 7-13.
- Wahyuni, S., Syafitri, R., Niko, N., & Ahsan, Z. R. (2023). Affirmation of Traditional Rights and Indigenous Women's Knowledge on Post-Mining Livelihood in Dompok Island, Riau Islands. *Indonesian Journal of Social and Environmental Issues (IJSEI)*, 4(2), 133-141.
- Wan, G., Wang, X., Zhang, R., & Zhang, X. (2022). The impact of road infrastructure on economic circulation: Market expansion and input cost saving. *Economic Modelling*, Volume 112(105854), 112.
- Yu, Z., Lanre, I., Irshad, R., Tanveer, M., Abdul, S., & Khan, R. (2023). Investigating the nexuses between transportation Infrastructure, renewable energy Sources, and economic Growth: Striving towards sustainable development. *Ain Shams Engineering Journal*, 14(2), 101843.
- Zul, A., Zaini, A., Vonnisa, M., Marzuki, M., & Ramadhan, R. (2023). *Seasonal Variation of Rainfall in Indonesia under Normal Conditions without ENSO and IOD Events from 1981-2021*. 9(11), 9899–9909.