

# Open Access Land Restoration Strategy Based on the Triple Bottom Line Approach for Achieving Sustainable Management of Open Access Land

Ahmad Dzulfikar Nurrahman<sup>1</sup>, Mohammad Khusaini<sup>2</sup>, Amin Setyo Leksono<sup>3</sup> and Hagus Tarno<sup>4</sup>

## Abstract

*This research aims to develop a sustainable Open Access Land (LAT) restoration strategy using the Triple Bottom Line (TBL) approach at three ex-mining locations in Malang Regency. The TBL approach integrates three main dimensions, namely economic, social and environmental to create balance in LAT management. Qualitative methods were used in this research, involving in-depth interviews with stakeholders, surveys, and document analysis to identify challenges and opportunities in implementing the TBL strategy in the three villages. The research results show that the TBL approach is able to provide a holistic and inclusive framework for LAT recovery at ex-mining sites. From an economic perspective, the development of ecotourism and organic farming are sustainable alternatives. From a social perspective, the active involvement of local communities in the LAT planning and management process increases their sense of ownership and responsibility towards the environment. From an environmental perspective, habitat restoration and water resource management activities help restore damaged ecosystems. The resulting recommendations include supporting policies, increasing community capacity, and strengthening collaboration between various stakeholders, so that a sustainable LAT management model can be realized in Malang Regency.*

**Keywords:** *Open Access Land Management, Sustainability, and Triple Bottom Line.*

## INTRODUCTION

Open Access Land (LAT) is an important component in maintaining ecological, economic and social balance in urban and rural areas (Fu et al., 2022). In Malang Regency, LAT is often threatened by mining activities that leave critical land after exploitation. Three significant ex-mining locations are Njulung Village in Wajak District, Ketindan Village in Lawang District, and Sumberejo Village in Gedangan District. These three villages are experiencing environmental degradation which requires a comprehensive and sustainable recovery strategy. Mining exploitation in these three villages has caused serious environmental damage, such as soil erosion, water pollution and loss of natural vegetation (Pandey et al., 2022). After mining activities end, former mines are often left without rehabilitation efforts, making them critical land that is unproductive and dangerous for local communities (Ofori et al., 2023). This condition poses a major challenge for effective and sustainable LAT management.

The Triple Bottom Line (TBL) approach offers a comprehensive framework for addressing these issues (Nogueira et al., 2023). TBL integrates three main pillars, namely economic, social and environmental, to ensure that each LAT recovery step does not only focus on one aspect, but covers all dimensions of sustainability (Brandão et al., 2024). By implementing the TBL approach, it is hoped that the former mines in the three villages can be restored into LAT that is productive and beneficial to the community (Moejane, 2022). From an economic perspective, TBL-based LAT restoration aims to increase productivity and economic value of land without damaging the environment (Hereu-Morales & Valderrama, 2022). The development of ecotourism and organic farming can be a sustainable economic alternative in former mines (Florez et al., 2022). This economic activity not only generates income for the community but also restores damaged ecosystem functions (Fu et al., 2023).

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<sup>1</sup> Doctoral Program of Environmental Science, Brawijaya University, Malang, Indonesia, Email: Ahmaddzulfikar05@gmail.com, (Corresponding Author)

<sup>2</sup> Department of Economics, Faculty of Economics and Business, Brawijaya University, Malang, Indonesia

<sup>3</sup> Department of Economics, Faculty of Economics and Business, Brawijaya University, Malang, Indonesia

<sup>4</sup> Department of Agricultural Entomology, Faculty of Agriculture, Brawijaya University, Malang, Indonesia

The social aspect of the TBL approach emphasizes the involvement and empowerment of local communities (Molina & Rajagopal, 2023). Active community participation in the LAT planning and management process is essential to ensure that their needs and aspirations are met (Wamsler, 2017). This involvement also increases the sense of ownership and responsibility towards LAT, which in turn can prevent land destruction and misuse (McIntyre-Mills et al., 2023). In Njulung Village, Ketindan Village, and Sumberejo Village, the TBL approach can be started by forming a working group consisting of local residents, local government, and environmental experts. This working group is tasked with designing and implementing a sustainable LAT recovery plan. The first step is to carry out an inventory of the condition of the land and existing resources, as well as identifying economic potential that can be developed (Liu et al., 2018).

The environmental aspect of TBL focuses on conservation and restoration of ecosystems (Esmail et al., 2023). Activities such as habitat restoration, tree planting, and water resource management should be a priority. In Njulung Village, for example, reforestation can help reduce soil erosion and improve water quality. Meanwhile in Ketindan Village and Sumberejo Village, good water management can reduce the risk of flooding and drought. This research aims to develop a sustainable LAT recovery strategy using the TBL approach at these three ex-mining locations. This research will explore how the integration of the three pillars of TBL can be applied effectively to recover and manage LAT. In addition, this research will also identify key factors that influence the successful implementation of the strategy, as well as provide practical guidance for policy makers, land managers and communities in developing sustainable LAT recovery strategies.

## **LITERATURE REVIEW**

Open Access Land Restoration (LAT) has become a significant research focus given the important role of LAT in maintaining ecological, economic and social balance. LAT, which includes public green spaces, parks, and recreation areas, provides ecological benefits such as providing habitat, flood control, and carbon sequestration, as well as social and economic benefits that include public health, aesthetic value, and increased property values (Choi et al., 2021). However, degradation of LAT, especially in ex-mining areas, poses major challenges that require a holistic recovery approach. Triple Bottom Line (TBL) is an approach that integrates three main dimensions of sustainability: economic, social, and environmental (Nogueira et al., 2023). This approach offers a comprehensive framework for designing LAT recovery strategies that focus not only on ecological restoration but also on community well-being and economic sustainability. Previous studies show that the application of TBL in land management can produce broader long-term benefits compared to conventional approaches (Reed et al., 2016).

From an economic perspective, LAT recovery can contribute to local economic growth through the development of sustainable sectors such as ecotourism and organic farming (Olivera-Villarreal et al., 2023). Research by Samal & Dash (2023) shows that ecotourism not only increases local income but also encourages environmental conservation. In addition, organic farming in ex-mining LAT can increase soil productivity and provide healthy products for communities, as shown in a study by Handono et al., (2023). The social aspect of TBL emphasizes the importance of community involvement and empowerment in the LAT recovery process. Research by Martini et al., (2017) shows that community participation in natural resource management increases the effectiveness of conservation and sustainability of projects. Active community involvement in planning and implementing LAT restoration projects can increase a sense of ownership and responsibility, ultimately reducing the risk of land destruction and misuse (Steven et al., 2023).

From an environmental perspective, LAT restoration aims to restore damaged ecosystem functions. Activities such as habitat restoration, reforestation, and water resources management are critical to this strategy. Research by Kollmann et al., (2016) emphasizes the importance of ecosystem restoration in increasing biodiversity and improving ecosystem function. Another study by Frietsch et al., (2023) shows that ecosystem restoration can increase adaptive capacity to climate change. The TBL approach also encourages the integration of policies that support sustainability. Policies that encourage sustainable land use and provide incentives for environmentally friendly practices can speed up the LAT recovery process. Research by Dechezleprêtre & Sato (2017) shows that strict environmental regulations can encourage innovation and efficiency, which ultimately increases economic competitiveness.

In Malang Regency, the application of TBL in the recovery of ex-mining LAT faces unique challenges. The three former mining locations, namely Njulung Village, Ketindan Village, and Sumberejo Village, each have their own characteristics and challenges. The study by Yuwati et al. (2021) show that the success of land restoration is strongly influenced by the involvement of local stakeholders and adapting strategies to local conditions. In this context, research involving local stakeholders through participatory methods is essential (Vaughn & Jacquez, 2020). This approach not only helps in identifying community needs and aspirations but also ensures that the strategies implemented are accepted and supported by the community. A study by Meena & Chand (2023) shows that a participatory approach to land management can increase project success through increasing community awareness and commitment.

Recovery of ex-mining LAT also requires collaboration between various stakeholders, including government, the private sector and non-governmental organizations. This collaboration can ensure that the necessary resources and expertise are available to support the recovery process. Research by Bjärstig & Sandström (2017) emphasizes the importance of partnerships in natural resource management to achieve more effective and sustainable results. Implementing technology and best practices in land restoration is also an important factor. Technologies such as geospatial mapping and environmental data analysis can help in planning and monitoring the recovery process. Research by Aronson et al., (2020) shows that the use of advanced technology can increase the efficiency and effectiveness of ecosystem restoration efforts.

Finally, it is important to note that LAT recovery is not only about restoring damaged land but also about building local capacity for sustainable management. Education and training for local communities on sustainable land management practices can help in maintaining the sustainability of long-term recovery outcomes (Bloomfield et al., 2018). The study by Gani et al. (2023) show that environmental education plays a key role in encouraging changes in conservation behavior and practices. Overall, TBL-based LAT recovery strategies offer a holistic and inclusive approach that can improve ecological, economic and social sustainability. It is hoped that the implementation of this approach in Malang Regency, especially in Njulung Village, Ketindan Village, and Sumberejo Village, can become a model for other areas facing similar challenges. By integrating the three pillars of TBL, this research contributes to achieving sustainable development goals and improving the quality of life of local communities.

## **METHODOLOGY**

This research uses a qualitative approach with the aim of developing a Triple Bottom Line (TBL)-based Open Access Land (LAT) recovery strategy in three ex-mining locations in Malang Regency: Njulung Village, Ketindan Village, and Sumberejo Village. A qualitative approach was chosen because it allows for in-depth exploration of stakeholders' experiences, views and expectations regarding LAT recovery (Hope et al., 2023). The main data collection methods include in-depth interviews, focus group discussions (FGD), and document analysis (Aitsidou et al., 2024).

In-depth interviews will be conducted with various stakeholders, including regional governments, local communities, non-governmental organizations, and experts in the environmental and economic fields (Li et al., 2024). This interview aims to understand the perspectives of each stakeholder regarding LAT damage, the economic potential that can be developed, as well as the challenges and opportunities in LAT recovery (Sharma et al., 2021). Focus group discussions will involve community representatives and other stakeholders to discuss initial findings and formulate recovery strategies that are acceptable and supported by all parties.

Document analysis will include a review of local policies, environmental reports, as well as case studies from other regions that have successfully implemented a TBL approach in LAT recovery (Song et al., 2018). Data collected from interviews, FGDs and document analysis will be analyzed thematically to identify key patterns, challenges and opportunities in TBL-based LAT recovery. The results of this analysis will be used to formulate recommendations for a comprehensive recovery strategy, which includes economic, social and environmental dimensions, in order to realize a sustainable LAT management model in Malang Regency.

## **RESULT AND DISCUSSIONS**

This research found that the Triple Bottom Line (TBL) approach was able to provide a holistic and comprehensive framework for the restoration of Open Access Land (LAT) in three ex-mining locations in Malang Regency: Njulung Village, Ketindan Village, and Sumberejo Village. The results of this research are described in three main dimensions of TBL: economic, social, and environmental.

### **Economic Dimensions**

From an economic perspective, this research found that the development of ecotourism and organic farming are two potential sectors that can be developed in former mines (Pashkov et al., 2024). In Njulung Village, for example, a former mining area has been identified as having the potential to become an ecotourism destination, offering natural views and opportunities for environmental education. Local communities are showing high interest in exploiting this opportunity, with the hope of increasing local income through sustainable tourism (Lara-Morales & Clarke, 2024). In Ketindan Village, organic farming is seen as an effective solution to restore critical land and provide healthy agricultural products. Research finds that land in former mines has the potential to be improved through sustainable farming techniques, such as agroforestry and the use of organic fertilizer. Local farmers have been given basic training in organic farming, and several pilot projects are showing promising results (Babajani et al., 2021). In addition, in Sumberejo Village, research identified opportunities for the development of small and medium enterprises (SMEs) that focus on local and environmentally friendly products. By utilizing local resources and community skills, SMEs can help diversify the village economy and reduce dependence on mining activities (Zvarivadza, 2018).

### **Social Dimension**

The social aspect of TBL-based LAT recovery emphasizes the importance of community participation and empowerment (Ammirato et al., 2020). This research found that community involvement in the LAT recovery planning and implementation process is critical to long-term success. In all three villages, local communities were actively involved in focus group discussions (FGD) to formulate a recovery vision and action plan (Islam & Wahab, 2020). In Njulung Village, the community together designed an ecotourism program that not only focuses on environmental conservation but also on education and involving visitors in conservation activities. The initiative received strong support from village youth, who saw an opportunity to improve their skills and earn additional income. In Ketindan Village, research found that the formation of organic farmer groups was an effective platform for empowering local farmers. This farmer group not only provides technical training but also builds a marketing network for organic products. Support from the regional government and local NGOs is very helpful in strengthening the capacity of this farmer group (Pradhan et al., 2023). In Sumberejo Village, the development of local product-based SMEs involves entrepreneurship and business management training for local residents. Women's participation in SME activities has also increased, providing a positive impact on women's economic empowerment and family welfare.

### **Environmental Dimensions**

From an environmental perspective, this research emphasizes the importance of ecosystem restoration and sustainable management of natural resources (Kalogiannidis et al., 2023). In the three villages, various restoration activities have been carried out to restore ecosystem functions damaged by mining. In Njulung Village, reforestation is carried out by planting local tree species that are resistant to the conditions of ex-mining land. This tree planting program not only aims to reduce soil erosion but also to increase biodiversity and provide habitat for wildlife (Dharmawan et al., 2023). Research shows that after two years, reforested areas begin to show signs of significant ecological recovery. In Ketindan Village, water resource management is the main focus. Ex-mining often leaves holes that can be used as water storage ponds (Christian et al., 2023). This research found that with appropriate water management techniques, these ponds can function as a water source for agricultural irrigation and meeting domestic water needs. Implementing an integrated water management system also helps reduce the risk of flooding and drought in the area. In Sumberejo Village, soil and water conservation activities are carried out through the construction of terraces and management of ground cover

vegetation. This effort succeeded in reducing erosion levels and increasing soil fertility. The use of organic fertilizer and compost is also encouraged to improve soil quality and reduce dependence on chemical fertilizers.

#### Analysis Findings

This study also identified several key factors that influence the success of TBL-based LAT recovery. First, policy and regulatory support from local governments is very important. Policies that support the development of ecotourism, organic farming and SMEs based on local products need to be strengthened and socialized to the community (Rosari et al., 2023). Second, collaboration between various stakeholders, including governments, NGOs, the private sector, and communities, is essential to ensure that the necessary resources and expertise are available (Clarke & MacDonald, 2019). The research found that strong partnerships help overcome technical and financial challenges in the recovery process. Third, education and training for local communities is very important to build capacity and increase awareness of the importance of sustainable LAT management. Training programs tailored to local needs help communities adopt best practices in LAT recovery and management (Berg et al., 2023).

Based on the findings of this study, several strategic recommendations are proposed for TBL-based LAT recovery. First, local governments must strengthen policies and regulations that support sustainable LAT management. Fiscal and technical incentives need to be provided to ecotourism initiatives, organic farming and local product-based SMEs (Nangpal et al., 2022). Second, there is a need to establish a collaborative forum involving all stakeholders to plan, implement and monitor the LAT recovery program. These forums can serve as a platform for sharing knowledge, resources and best practices (Huang et al., 2023). Third, education and training programs should be expanded and focused on developing the technical and managerial skills needed for LAT recovery. Environmental education should be integrated into school curricula and community training programs to increase public awareness and participation. Fourth, further research is needed to monitor and evaluate the long-term impact of TBL-based LAT recovery strategies. Longitudinal studies will help identify successes and emerging challenges, as well as provide the data needed to adjust existing strategies (Gimenez et al., 2024).

By implementing a TBL-based LAT recovery strategy, it is hoped that the former mines in Njulung Village, Ketindan Village and Sumberejo Village can be transformed into sustainable and productive LAT. This approach not only restores damaged environments but also improves the economic and social welfare of communities, creating a LAT management model that can be replicated in other areas. This research shows that by integrating the three pillars of TBL, LAT recovery can be carried out in a holistic, sustainable and inclusive manner.

#### **CONCLUSION**

This research concludes that the application of the Triple Bottom Line (TBL) approach in the Open Access Land (LAT) recovery strategy in three ex-mining locations in Malang Regency is able to create a sustainable LAT management model. The TBL approach that integrates economic, social and environmental dimensions has been proven effective in overcoming ecological damage, improving community economic welfare and strengthening social participation and empowerment. Through the development of ecotourism, organic farming and local product-based SMEs, this research shows that LAT can be restored and optimized for long-term benefits for local communities. The results of this research also emphasize the importance of support for government policies and regulations, multi-stakeholder collaboration, as well as education and training for local communities. Strong policy support and effective collaboration between government, NGOs, the private sector and communities have proven critical to the success of LAT recovery. In addition, education and training programs aimed at increasing community awareness and technical skills play a key role in ensuring the sustainability of recovery strategies. Thus, the TBL approach not only restores damaged environments but also creates a sustainable LAT management model that can be replicated in other areas with similar challenges.

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