

Empowering Coconut Coir Waste through COCONET Innovation for Post-Mining Reclamation: A CSR Initiative by PT ANTAM Tbk. UBPN North Maluku

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Abstract. The COCONET development program represents an innovative approach to post-mining land reclamation based on the utilization of coconut coir waste. Developed by PT ANTAM Tbk, North Maluku Nickel Mining Business Unit (UBP), this program targets not only ecological restoration but also the social and economic empowerment of local communities through an inclusive empowerment scheme. This article systematically examines the design, implementation, and impact of the COCONET program from environmental, social, and economic perspectives, while also assessing its potential for replication in other regions. This study adopts a descriptive-qualitative method using a case study approach. The findings reveal that the COCONET program has successfully established an efficient, environmentally friendly, and inclusive reclamation model.

Keywords: Coconut Coir Waste, Post-Mining Reclamation, COCONET Innovation, Community Empowerment.

A. INTRODUCTION

The mining industry plays a strategic role in national economic development, yet its operations also leave significant ecological impacts, particularly concerning land degradation. Post-mining reclamation has become a legal and moral obligation for all mining entities. However, the effectiveness of reclamation is not solely determined by technical success, but also by social sustainability and community participation. Therefore, reclamation approaches that integrate environmental, social, and economic dimensions are increasingly important to ensure long-term sustainability. In this context, innovation in reclamation must be capable of empowering surrounding communities while also utilizing the potential of locally available resources.

The North Maluku region, particularly East Halmahera Regency, has abundant coconut potential. Unfortunately, coconut coir as an organic waste has not been fully utilized. On the other hand, PT ANTAM Tbk UBPN Nickel North Maluku faces pressing needs for post-mining land reclamation. Responding to this potential, the CSR program known as *Pasir Laut* (Integrated Coconut Waste Industry Development Program) emerged as an innovation that integrates coconut waste management with mine reclamation efforts through a community empowerment approach. The main product of this program is COCONET, a coconut coir fiber net. The name COCONET comes from the words 'coco' (coconut) and 'net', reflecting its

function as a coir-based mesh product. Its primary purpose is to serve as a soil retainer to prevent erosion on reclaimed land. More than just an ecological product, the COCONET production process involves training, mentoring, and the formation of local community enterprises, particularly involving coconut farmers. This approach positions the *Pasir Laut* program as a multidimensional solution that addresses waste, empowers communities, and restores the environment.



Figure 1. Distribution and Potential of Coconut Forests in North Maluku

Source: Author's Personal Documentation (2025)

This paper aims to examine how the COCONET development program is designed, implemented, and its impacts on local environmental, social, and economic conditions. Furthermore, it explores the sustainability and replication potential of the program in other regions with similar resource characteristics. A critical approach to this model is necessary to assess its effectiveness and scalability as a sustainable reclamation solution.

B. METHOD

This research applies a descriptive qualitative approach using case study and literature review methods. The primary case analyzed is the *Pasir Laut* program implemented by the Fagalgali Group in Geltoli Village. The analysis focuses on institutional context, coconut waste potential, COCONET production processes, program impacts, replication efforts, and sustainability. The data are analyzed using the triple bottom line framework (environmental, social, economic) to measure the multidimensional impact of the program. Additionally, the community engagement model is analyzed using an asset-based community development (ABCD) perspective. Triangulation was performed by examining quantitative data (production volumes, cost-efficiency, and reclaimed land area) and qualitative data (narratives of mentoring, testimonials, awards, and replication outcomes).

This approach aims to describe the relationship between the utilization of coconut waste and the effectiveness of post-mining land reclamation as well as local socio-economic

empowerment. The evaluation is conducted not only on the output (COCONET products) but also on outcomes (social and environmental change) and impacts (sustainability and external recognition).

C. RESULT AND DISCUSSION

1. Utilizing Coconut Coir Waste as a Sustainable Reclamation Solution

The North Maluku region, especially East Halmahera, has significant coconut production potential, but most of the coconut coir waste remains underutilized. Typically, coconut coir is discarded or burned, resulting in air pollution and soil degradation. Through the *Pasir Laut* program and the development of COCONET products, PT ANTAM Tbk UBP Nickel North Maluku intervened by transforming this waste into the main raw material for COCONET a coconut coir mesh that functions to stabilize soil and prevent erosion in post-mining areas. This approach not only addresses ecological reclamation challenges but also serves as a zero-waste initiative in the coconut agriculture sector. Utilizing coconut coir marks the beginning of a local resource management effort for a material previously regarded as waste.



Figure 2. The Production Process of COCONET Weaving

Source: Author's Personal Documentation, 2024

COCONET transforms waste into value-added products through an efficient and optimized production chain. The production process begins with the collection of coconut coir by farmer groups. The coir is then separated from other materials using a fiber-separating machine. The resulting fibers are sorted into coarse and fine types, then spun into rope and manually woven into mesh. This process is carried out at the community level through training and direct assistance by the CSR team of PT ANTAM Tbk UBP North Maluku. The use of appropriate technology and local empowerment is emphasized throughout this process. Though relatively simple, the machines employed significantly enhance the product's added value. The initiative also produces other derivative products such as cocopeat (growing medium) and cocopot (organic planting pots), all derived from the same coconut coir waste.



Figure 3. Final Products: Cocopeat and Cocopot

Source: Author's Personal Documentation, 2024

The *Pasir Laut* COCONET program is not merely an environmental project, but also a social and economic capacity-building program. Farmers, housewives, and village youths are actively involved throughout the production chain—from material sorting to spinning and weaving. The program provides alternative incomes for communities around the mine, reaching IDR 1–2 million per month. Moreover, the formation of community-based business groups fosters social solidarity, economic independence, and a sense of ownership. This model aligns with the principles of asset-based community development, which emphasizes the use of local potential.

Technically, COCONET has proven effective in accelerating revegetation in degraded mining land. The product functions as an erosion barrier, retains soil moisture, and facilitates plant cover growth. Company records indicate that reclaimed areas using COCONET showed faster revegetation success compared to conventional methods. COCONET also offers supply chain sustainability advantages. According to internal data, COCONET is more economical than synthetic geotextiles, offering up to 50% cost savings (PT ANTAM, 2024). This finding aligns with Sutaryo and Wahyudi (2021), who emphasize the importance of transitioning to green, locally sourced materials in mine reclamation. This efficiency reflects not only pricing but also the renewable nature of materials derived from organic waste. Nonetheless, success does not come without technical and social challenges. On the technical side, potential fluctuations in coconut coir supply must be anticipated amid increasing demand. Strategies such as raw material diversification (e.g., integrating other plant fibers) and stock management are essential to ensure supply chain sustainability. Furthermore, a Life Cycle Assessment (LCA) is necessary to measure the full ecological impact of COCONET compared to other reclamation materials, including carbon emissions and energy consumption throughout the production process (Suh et al., 2004; Finnveden et al., 2009).



Figure 3. Utilization of COCONET in the Reclamation Area of Pakal Island

Source: Author's Personal Documentation, 2024

On the social side, the model demonstrates effective asset-based community development (ABCD) practices. Local skills development, the establishment of independent business groups, and the emergence of derivative enterprises (such as shops and communal farms) (PT ANTAM, 2024, pp. 94–96) affirm the importance of strengthening community assets. This supports literature indicating that local resource-based social reinforcement is strongly correlated with rural socio-economic resilience (Yunus & Yunus, 2019; Alkire et al., 2020). The program has also been successfully replicated in several villages with similar characteristics, such as Buli, Wailukum, and Sagea. Replication was facilitated through structured training, the establishment of local facilitator teams, and tripartite collaboration between corporate CSR teams, village governments, and community groups. This reinforces the argument that community- and waste-based reclamation approaches have high scalability potential if supported by technology transfer and institutional backing (Korten, 1993; Chambers, 1997).

Overall, the COCONET program demonstrates that post-mining reclamation innovation rooted in local waste utilization and community empowerment is not only technically and economically viable but also socially and ecologically sustainable. The program's success strengthens the argument that community-based solutions, supported by adequate institutions, can holistically address post-mining environmental challenges. With its strong replication potential across regions, COCONET deserves to be considered a national model for circular economy-based reclamation policy and equitable development.

D. CONCLUSION

The COCONET program is a multidimensional innovation that combines ecological and socio-economic approaches to post-mining reclamation. Based on coconut coir waste utilization and local community empowerment, the program has demonstrated success in restoring degraded mining land, improving local economic welfare, and creating an inclusive and adaptive empowerment model.

This success is driven by synergy among corporations, communities, and local institutions in program design and implementation. The effectiveness of reclamation using COCONET is superior in both ecological and economic terms compared to conventional methods. Meanwhile, social aspects such as training, business group formation, and increased income demonstrate that community-based approaches can serve as sustainable solutions for managing mining impacts. Therefore, COCONET can be positioned as a reference in sustainable development rooted in local resources and ecological justice.

Furthermore, this approach opens opportunities for national policy formulation that promotes the use of agricultural waste-based reclamation materials. The government can design incentive schemes for industries applying green technologies and community empowerment in reclamation. COCONET also holds potential as a best practice for other tropical countries facing similar reclamation challenges, demonstrating that local resource-based solutions can have global relevance.

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