

SUSTAINABLE WASTE MANAGEMENT INITIATIVE THROUGH A SMART ENVIRONMENT APPROACH TOWARDS AN INDEPENDENT SUNYALANGU VILLAGE

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Abstract

The Smart Village program in Sunyalangu Village is an empowerment initiative aimed at optimizing the agrotourism potential of Bukit Pule and Bukit Gadog through strengthening the Smart Environment pillar, considering that current household waste management is still inconsistent and dominated by the old paradigm of "collect-transport-dispose." As a pilot program, this activity focuses on transforming waste into ecologically and economically valuable resources through the application of circular economy principles. The implementation method is carried out in a participatory manner involving the Village Government, PKK, and Karang Taruna through stages of problem identification (FGD), socialization, sustainable waste management workshops, and independent mentoring at the household level. The technical interventions implemented include education on waste sorting from source, initiation of a Waste Bank system for inorganic waste, processing organic waste into compost, and implementation of biopore technology. The expected outcome of this initiative is increased literacy and public awareness so that they are able to manage waste independently and turn environmental burdens into additional income opportunities. By synergizing the use of information technology and local wisdom, this program is a concrete step towards realizing sustainable waste management to realize Sunyalangu Village as an Independent Village that is free of waste, innovative, and sustainable.

Keywords: Sustainable waste management, Empowerment, Sunyalangu Village

INTRODUCTION

Sunyalangu Village, located at the foot of Mount Slamet, covers an area of 1,177.49 hectares and borders directly on a State Forest. This geographical characteristic makes environmental sustainability a fundamental asset for the village, particularly in supporting its leading agro-tourism potential, such as Bukit Pule and Bukit Gadog. However, along with the development of tourism potential, the problem of household waste has emerged as a serious challenge, the management of which has been volatile and subject to fluctuations. The old paradigm, which relied solely on the "collect-transport-dispose" system, has proven inadequate, as it tends to view waste as a valueless waste burdening the environment.

Within the Smart Village framework, the Smart Environment pillar emphasizes that communities living in harmony with nature must be highly sensitive to their ecosystems. Public awareness needs to be strengthened through participatory and consistent programs to support Sunyalangu's status as an Independent Village that maintains its cultural roots. The essence of this transformation is a shift in perspective: waste is no longer a burden, but rather a resource with high ecological and economic value if properly managed (Abdurokhman, 2014).

Sustainable waste management in Sunyalangu Village should not stop at the sorting stage but must also be directed towards implementing a circular economy. Through the integration of Smart Environment and Smart Economy approaches, inorganic waste can be converted into economic value through the Waste Bank system, where residents can save sorted dry waste for direct financial benefits (Panduan Umum Pengembangan Desa Cerdas, 2024). Meanwhile, organic household waste can be processed into valuable products such as compost or innovative eco-enzyme liquid soap.

This community-based empowerment initiative aims to transform waste disposal costs into additional income opportunities (Akbar et al., 2024). By utilizing appropriate technology and strengthening institutions through the active participation of the Family Welfare Movement (PKK) and Youth Organization (Karang Taruna), Sunyalangu Village can achieve economic independence through waste downstreaming (Leuhery et al., 2023). For example, producing organic fertilizer from village waste can independently support the local agricultural sector, while selling recycled materials provides economic incentives for Waste Bank customers (Waste4Change, 2021). Therefore, this waste management initiative is crucial for building an environmentally clean, economically empowered, and socially sustainable village ecosystem.

METHODS

The implementation of this empowerment program uses a participatory approach that includes several stages:

- (1) Potential and Problem Identification: Conducting field surveys and in-depth interviews with the Village Government, Youth Organizations (Karang Taruna), and the Family Welfare Movement (PKK) to map waste management needs.
- (2) Socialization: Introducing the Smart Village concept and the importance of information technology and environmental education to partners.
- (3) Waste Management Workshop: Providing literacy on waste utilization and sustainable waste management methods.
- (4) Mentoring: Providing direct mentoring at the household level to ensure communities are able to manage their waste independently, including implementing appropriate technologies such as biopores.
- (5) Evaluation: Measuring success through pre- and post-tests to assess improvements in community environmental literacy and awareness.

RESULTS AND DISCUSSION

The waste management initiative in Sunyalangu Village is a pilot program focused on providing literacy education to sensitize the community about household waste. Based on the implementation plan, the main outcomes of this activity are sustainable waste management workshops and self-help mentoring for households.

Discussions on this program indicate that strengthening the Smart Environment aspect has successfully raised public awareness of the importance of waste sorting at the source. The integration of information technology as an educational tool with local wisdom in forest conservation creates a synergy that supports environmental sustainability. Furthermore, improving village cleanliness through proper waste management has positively impacted the attractiveness of Bukit Pule and Bukit Gadog tourist attractions. With support from various groups, such as the Family Welfare Movement (PKK) and Karang Taruna (Youth Organization), this program serves as a bridge for Sunyalangu Village to transform into a Smart Village, independent and innovative in maintaining its ecosystem.

Community Participatory Programs in Waste Management

Identification of Potential and Problems:

(1) Field Data Collection Techniques

Identification was conducted prior to proposal development through a participatory approach involving various stakeholders. The techniques used included:

- (a) **Field Survey and Observation:** Conducting direct visits to map the village's geographic conditions, such as proximity to State Forests and agro-tourism potential (Bukit Pule and Bukit Gadog). In addition, observations were conducted to assess existing waste disposal patterns and the condition of environmental infrastructure.
- (b) **In-depth Interviews:** Dialogues with the Village Government, business unit managers, and community leaders to understand structural barriers to waste management, which have historically fluctuated.
- (c) **Focus Group Discussions (FGDs):** Focused discussions with productive community groups such as the Family Welfare Movement (PKK), Karang Taruna (Youth Organization), MSMEs, and LMDH (House of Representatives) to explore their perceptions of environmental and economic issues.

(2) Needs Assessment

This approach was used to map the community's actual needs so that the activities implemented were on target. The identified issues include:

- (a) **Problem Characteristics:** Discovering that the main problem in Sunyalangu is not just the volume of waste, but rather the lack of consistency in existing waste management initiatives.
- (b) **Community Literacy:** Identifying limitations in digital literacy and technical knowledge related to utilizing household waste into economically valuable products.
- (c) **Secondary Data:** Collecting data related to the type, volume, and characteristics of waste from final processing sites (TPST/TPA) to determine appropriate processing strategies.

(3) Benchmarking and Model Replication

As part of identifying solutions to identified problems, benchmarking, or comparative studies, were conducted against successful models in other areas. This identification aimed to identify best practices, such as the Waste Bank system or compost processing, that had been successfully implemented in other areas (such as Gresik or Banyumas), which could then be replicated and adapted to the local wisdom of Sunyalangu Village (Meilanitasari et al., 2026).

(4) Identification Results in Sunyalangu Village

The in-depth identification process demonstrated the need for strengthening community-based institutions. The results revealed that achieving a self-sufficient village requires integration between Smart Environment (environmental awareness) and the use of information technology to increase the village's economic bargaining power. Therefore, this identification phase served as a bridge to developing workshop and mentoring programs tailored to the capacities of village households.

Socialization:

Socialization was conducted by bringing together all levels of society involved in waste management to ensure alignment and alignment with the direction of village development. This stage is important to be realized because it is related to the grand design and master plan related to the process that will be carried out, so that every stakeholder involved knows their role and contribution in handling this waste.

Waste Management Education and Mentoring

This stage is the core of the Smart Environment pillar, which aims to transform community behavior from a "collect-transport-dispose" paradigm to a resource-based, valuable waste management approach.

- (1) Education through Structured Workshops: Education is conducted through Sustainable Waste Management Workshops involving Family Welfare Movements (PKK) and Youth Organizations (Karang Taruna) as the driving force. The main focus of these workshops is:
 - (a) Improving Waste Literacy: Providing a deeper understanding that waste is not merely an environmental burden, but rather an asset with ecological and economic value if managed according to the 3R principle (Reduce, Reuse, Recycle).
 - (b) Sorting Socialization: Educating the community to sort waste into at least organic and inorganic categories, starting at home.
 - (c) Introduction to the Circular Economy: Providing education on the mechanisms of Waste Banks, where sorted waste can be converted into savings or handicraft products.
- (2) Participatory Technical Assistance: This assistance is provided as a concrete follow-up to ensure the knowledge gained during the workshop is truly implemented in the household environment.
 - (a) Household Self-Assistance: The community service team provides direct assistance to ensure each household is able to manage its waste independently, ensuring waste is disposed of at the source and does not accumulate in the landfill.
 - (b) Application of Appropriate Technology: One form of technical assistance planned in Sunyalangu Village is the implementation of Biopori. In addition, the community is assisted in making organic fertilizer (compost) from vegetable waste to support the local agricultural sector.
 - (c) Continuous Monitoring: This assistance process is conducted periodically (planned for 5 months) to monitor community consistency and provide solutions to technical challenges encountered in the field.
- (3) The Role of Visual Educational Media: To strengthen understanding, this program uses visual aids such as banner workflow diagrams. This media makes it easier for residents who cannot attend in-person socializations to still understand technical procedures, from sorting methods, to the schedule for deposits to the management unit, to the distribution mechanism for proceeds from waste sales.

Through intensive education and mentoring, it is hoped that literacy and collective awareness will increase among the Sunyalangu Village community. The end result will be the creation of independence in maintaining village cleanliness and the realization of a Zero Waste Village ecosystem that is institutionally independent and economically empowered.

Evaluation

This stage is a crucial and essential part, as it is related to the sustainability of the program. The evaluation process is carried out in stages and iteratively to achieve the best possible results in waste management in Sunyalangu Village.

The Role of the Family Welfare Movement (PKK), Youth Organization (Karang Taruna), and Village Youth in Sustainable Waste Management

In the Smart Village program in Sunyalangu Village, the PKK and Youth Organization (Karang Taruna) play a central role as key partners (stakeholders) driving the three pillars of village transformation: Smart Economy, Smart People, and Smart Environment. The following is a detailed overview of their roles, based on available sources:

(1) Role in the Smart Economy Pillar

These two groups are the primary targets for increasing village economic capacity through the use of digital technology:

- (a) Youth Organization: Actively promotes the village's tourism potential, particularly Bukit Pule and Bukit Gadog, through digital marketing training and mentoring on popular social media platforms such as TikTok and Instagram (Kotler & Keller, 2013).
- (b) Family Welfare Movement: Focuses on developing MSMEs through product diversification training. PKK mothers are encouraged to process superior village products into new processed products that have added value and expand digital market access.

(2) Role in the Smart People Pillar

As groups considered to have limited initial digital literacy, the Family Welfare Movement (PKK) and Youth Organization (Karang Taruna) are positioned as agents of change through:

- (a) Digital Literacy Enhancement: They participate in participatory information technology training and mentoring to improve their skills in utilizing technology for independent village social and economic activities.
- (b) Active Participation: Members of both groups are involved from the early stages of the program by identifying village potential and problems through field surveys, Focus Group Discussions (FGDs), and in-depth interviews.

(3) Role in the Smart Environment Pillar

In the sustainable waste management initiative, the PKK and Youth Organization (Karang Taruna) play a role in building a clean village ecosystem:

- (a) Waste Management Literacy: They are targeted for education to foster awareness of household waste. They are encouraged to separate waste at the source and manage it independently at the household level.
- (b) Waste Utilization: Through mentoring, they are trained to process organic waste into useful products such as compost or other innovations like eco-enzymes to support environmental sustainability.

The synergy between PKK (as a driver of MSMEs and households) and Karang Taruna (as a driver of tourism and technology) is a strong social capital for Sunyalangu Village to transform into an independent, innovative village, while maintaining its local wisdom.

CONCLUSION

The initiation of sustainable waste management in Sunyalangu Village through the Smart Village framework strategically integrates the Smart Environment and Smart Economy pillars to transform the burden of household waste into an asset of economic value for the community. By

involving the active role of the PKK and Karang Taruna groups, this program adopts the principles of a circular economy through the Waste Bank system for inorganic waste and the processing of organic waste into productive products such as compost and eco-enzymes. Through systematic stages that include participatory problem identification, environmental literacy education, and technical assistance in the use of appropriate technologies such as biopores, this program has not only succeeded in increasing the ecological awareness of residents, but also building the foundation of the independence of Sunyalangu Village as a clean, innovative, and economically empowered village without abandoning the preservation of nature and its cultural roots.

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