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EcoRevolusi Sungai: Education, Innovation, and Circular Economy Approaches to Address Flooding and Waste Issues in Wawonduru Village

[123]Julkifli, Ardiansyah, Aidin
[1]STKIP Al-Amin Dompu

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Abstract
Flooding and river pollution in Wawonduru Village, Woja District, Dompu Regency are primarily caused by low public awareness of waste management and the absence of an integrated waste sorting and management system. This condition motivated the implementation of a community service program entitled EcoRevolusi Sungai, which aims to enhance community capacity and participation in waste management based on circular economy principles and technological innovation. The program employed a participatory approach encompassing socialization activities, training, workshops, the provision of waste-sorting facilities, mentoring, and evaluation. The target groups included Karang Taruna ASWAD, the Wawonduru Student and Youth Association (KEMAP-W), and the surrounding community. The results indicate the availability of waste-sorting facilities in the form of Five-Category Waste Bins (T-5K), the implementation of the SIMAS SAKIKU Digital Waste Bank System, the utilization of organic waste composters, and an improvement in the knowledge and skills of partners in community-based waste management. Socialization and mentoring activities encouraged behavioral changes from indiscriminate waste disposal toward more responsible waste sorting and management practices. Furthermore, the role of youth organizations as managers of the waste bank and digital system was strengthened, leading to the establishment of a sustainable community-based waste management system that contributes to reducing environmental pollution and flood risks in Wawonduru Village. The EcoRevolusi Sungai program demonstrates potential as a community engagement model for village-level environmental management and flood risk reduction.

Corresponding Author:
Julkifli
STKIP Al-Amin Dompu
Email Coresspoden: julkifli1990@gmail.com

1. INTRODUCTION

Wawonduru Village, Woja Subdistrict, Dompu Regency, is an area that regularly experiences annual flooding due to river channels being clogged by household waste. This condition is consistent with findings indicating that rivers in many regions of Indonesia have functioned as waste disposal sites as a result of low environmental awareness and weak community-based waste management systems (Aristananda et al., 2023). The EcoRevolusi Sungai program document also shows that prior to the implementation of the program, the community had not developed the habit of sorting waste at the source and was not supported by adequate facilities and management systems. Consequently, waste accumulated in river channels and residential environments.

These problems have had a direct impact on increasing flood risk and the degradation of environmental quality. Data from the National Environmental Risk Index indicate that areas with weak waste management systems have higher levels of environmental vulnerability to hydrometeorological disasters (Bappenas, 2023). At the local level, Dompu Regency is classified

as a disaster-prone area influenced by environmental factors, including waste management and river conditions, as stated in the Dompu Disaster Risk Index Report issued by the Dompu Regional Disaster Management Agency (BPBD Dompu, 2022). Therefore, the waste issue in Wawonduru Village should not be viewed merely as a technical problem, but rather as an environmental and disaster-related issue that requires systematic and sustainable interventions.

Figure 1. These problems

From a social perspective, the low level of community and local organizational involvement in environmental issues has further exacerbated the waste problem. Research by Wibowo, Fitriani, and Hanifah (2024) emphasizes that the revitalization of village youth organizations plays a strategic role in encouraging behavioral change and strengthening community-based environmental movements. This condition is relevant to the context of Wawonduru Village, where Karang Taruna ASWAD and the Wawonduru Student and Youth Association (KEMAP-W) have strong potential as agents of change, yet had not previously been optimally empowered in waste and environmental management.

Current sustainable waste management approaches are increasingly directed toward the implementation of the circular economy concept, which views waste as a resource with economic value. Firmansyah, Rakhmat, and Devi (2022) argue that waste-based circular economy initiatives are capable of integrating environmental aspects with social entrepreneurship, so that waste management is oriented not only toward cleanliness but also toward improving community welfare. This approach is highly relevant for application in Wawonduru Village to shift the community paradigm from disposing of waste to managing and utilizing it productively. Along with technological advancements, the digitalization of community-based waste management has become an important strategy. Halimah and Machdum (2023) assert that the implementation of digital waste bank systems can enhance transparency, accountability, and community participation in environmental management. These findings strengthen the rationale for selecting the SIMAS SAKIKU Digital Waste Bank System in the EcoRevolusi Sungai program as an integrated platform for recording and managing waste in alignment with community activities.

Based on these conditions and studies, the EcoRevolusi Sungai program was designed as a community service initiative that integrates environmental education, youth organization empowerment, the provision of waste sorting facilities, and the application of technology-based circular economy innovations. The interventions were implemented through the installation of Five-Category Waste Bins (T-5K), training on waste sorting and processing, and assistance in the use of a digital waste bank system. This approach aligns with best practices in waste management in riverbank residential areas, which emphasize innovation and community participation as key success factors (Raghav et al., 2022).

The novelty of the EcoRevolusi Sungai program lies in the integration of physical waste sorting infrastructure, the strengthening of village youth organizations, and the implementation of a community-based digital waste bank system within a single community service framework. This integration not only promotes behavioral change but also establishes a data-driven, economically valuable waste management system oriented toward disaster risk reduction.

Accordingly, EcoRevolusi Sungai serves as an innovative, contextual, and replicable model of community service for other areas facing similar challenges.

2. IMPLEMENTATION METHOD

The implementation method of the EcoRevolusi Sungai program employed a participatory approach based on community empowerment. The activities were carried out in Wawonduru Village, Woja Subdistrict, Dompu Regency, targeting Karang Taruna ASWAD, the Wawonduru Student and Youth Association (KEMAP-W), and the surrounding community affected by waste management issues and recurrent flooding. The program implementation began with a preparatory phase involving coordination with the village government, environmental condition mapping, and the identification of partner needs. The implementation phase included socialization activities on sustainable waste management, training and workshops on waste sorting, the installation of Five-Category Waste Bins (T-5K), and the application of the SIMAS SAKIKU Digital Waste Bank System as an innovation in circular economy–based waste management (Firmansyah et al., 2022; Halimah & Machdum, 2023). The mentoring phase was conducted continuously to strengthen partner capacity and ensure program sustainability (Wibowo et al., 2024).

Program evaluation was conducted through field observations and activity documentation to assess program implementation and its initial impacts on environmental cleanliness and the reduction of waste accumulation in river areas (Raghav et al., 2022).

3. RESULTS AND DISCUSSION

This section presents the results of the EcoRevolusi Sungai program implementation and discusses the achievements of community service activities in improving waste management and village environmental quality.

1.1.Research Results

The implementation of the EcoRevolusi Sungai program produced various tangible outputs that reflect the comprehensive achievement of community service objectives, encompassing physical, social, institutional, and technological aspects. The main output of the program was the provision and installation of 150 units of Five-Category Waste Bins (T-5K), strategically placed throughout Wawonduru Village, particularly in riverbank areas and densely populated residential zones that had previously been major waste accumulation points. These facilities function not only as waste management infrastructure but also as visual educational media that encourage community awareness of the importance of waste sorting at the source.

In addition to the provision of physical facilities, the program successfully implemented the SIMAS SAKIKU Digital Waste Bank System as an information technology–based innovation in waste management. This system was utilized by the target partners, namely Karang Taruna ASWAD and the Wawonduru Student and Youth Association (KEMAP-W), as a tool for recording, managing, and monitoring waste in a more orderly and structured manner. Through this system, waste management processes that were previously manual and poorly documented have shifted to a data-driven approach, thereby facilitating evaluation and informed decision-making. Documentation of community waste management socialization activities is presented in the following figure.

Figure 2. Waste management socialization for the community

Clear changes in conditions before and after the program implementation were observed. Prior to the program, waste management in Wawonduru Village was still conventional, without waste sorting, and was dominated by the practice of disposing of waste into the river and surrounding environment. This condition contributed to environmental pollution and an increased risk of annual flooding. After the program was implemented, the community began to demonstrate behavioral changes, as indicated by increased awareness of waste sorting according to categories, the use of the provided segregated waste bins, and waste recording through the digital waste bank system. Initial data show that 30 kg of sorted waste were recorded in the system, serving as an early indicator of increased community participation. The implementation and recording activities of the SIMAS SAKIKU Digital Waste Bank are presented below.

Figure 3. Implementation and recording of the SIMAS SAKIKU Digital Waste Bank

In addition, the program also had an impact on enhancing the capacity and competence of partners in environmental management. The partners gained a more comprehensive understanding of the circular economy concept, the operational mechanisms of waste banks, and the importance of organic waste management. Through training and mentoring, the partners were able to apply composters as a solution for household organic waste processing. The implementation of composters contributes to reducing the volume of waste disposed into the environment while producing compost fertilizer that can be utilized for agricultural activities, greening programs, and household gardens. The implementation of composters for organic waste processing is illustrated in the following figure.

Figure 4. Implementation of composters for organic waste processing

The EcoRevolusi Sungai program also produced information technology–based outputs in the form of a supporting website for waste bank management, equipped with features for data recording, activity information, and environmental education. The website was designed as a tool to enhance transparency in waste management, a communication medium between managers and the community, and an instrument for disseminating best practices in community-based waste management. As a means of strengthening program sustainability,

this technological output is planned to be registered as Intellectual Property Rights (IPR). The IPR and the display of the waste bank website are presented in the following figure.

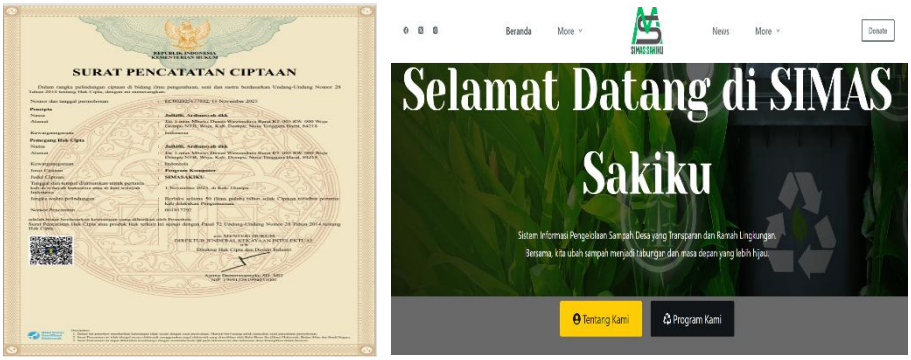

Figure 5. Intellectual Property Rights (IPR) and the Waste Bank Website Interface

1.2. Discussion

The achievements of the EcoRevolusi Sungai program indicate that a community service approach integrating community participation, the strengthening of youth institutions, and technological innovation is capable of generating significant and sustainable changes in the village waste management system. The installation of Five-Category Waste Bins and the implementation of a digital waste bank not only serve as technical solutions but also function as instruments of social transformation that encourage changes in community mindsets and behaviors toward waste.

The increasing role of village youth organizations as the main managers of the waste bank demonstrates that empowering local institutions is an effective strategy for community-based environmental management. Karang Taruna ASWAD and KEMAP-W successfully transformed from conventional social organizations into key driving actors in village environmental management. This finding is consistent with Wibowo, Fitriani, and Hanifah (2024), who emphasize that the revitalization of village youth organizations makes a significant contribution to the success of sustainable environmental programs.

The implementation of SIMAS SAKIKU as a digital waste bank has had a positive impact on the transparency and accountability of waste management. Data-driven recording systems enable waste management to be conducted in a more orderly, measurable, and accountable manner. In addition to increasing public trust, this digitalization also opens opportunities for the development of incentive systems based on waste volume and type, which can ultimately encourage broader community participation. This is in line with Halimah and Machdum (2023), who state that technological innovation in waste banks can enhance the effectiveness of environmental management and community participation. From a circular economy perspective, the results of this program reinforce the view that waste can be positioned as a resource with economic value when managed through appropriate systems. Waste sorting, waste bank management, and the utilization of composters demonstrate tangible efforts to create resource reuse cycles and reduce waste generation. The application of composters is also consistent with the concept of sustainable organic waste management, which can reduce waste volume while improving the quality of the residential environment (Raghav et al., 2022).

The presence of the website and the planned submission of Intellectual Property Rights (IPR) further strengthen the sustainability and replicability of the program. The website enables systematic documentation of data and waste management practices, while IPR provides protection for the innovations produced, thereby adding both academic and practical value to the program. Thus, EcoRevolusi Sungai not only contributes to solving local environmental problems but also has strong potential to be replicated in other areas facing similar challenges.

4. CONCLUSIONS

The community service program through EcoRevolusi Sungai has successfully achieved its main objective, namely improving community-based waste management as an effort to reduce environmental pollution and flood risks in Wawonduru Village, Woja Subdistrict, Dompu Regency. The achievements of the program are demonstrated through the provision of waste sorting facilities in the form of Five-Category Waste Bins (T-5K), the implementation of the SIMAS SAKIKU Digital Waste Bank System, the management of organic waste through composters, and the increased understanding and skills of partners in circular economy–based waste management. In addition, the intensive socialization and mentoring activities have successfully encouraged changes in community behavior, shifting from indiscriminate waste disposal to more responsible and sustainable waste sorting and management practices.

The impact of the program on target partners, namely Karang Taruna ASWAD and the Wawonduru Student and Youth Association (KEMAP-W), is evident in the increased role and capacity of youth organizations as the main drivers of village environmental management. The partners not only participate in activities but also act as managers of the waste bank and digital system, thereby fostering independence, responsibility, and a sense of ownership of the program. The sustainability of the EcoRevolusi Sungai program is supported by the presence of technology-based waste management systems, the strengthening of partner institutions, and the potential utilization of waste as an economic resource. The existence of the waste bank management website and the planned registration of Intellectual Property Rights (IPR) for technological outputs are key supporting factors for program sustainability and future replication. Moreover, the program has the prospect of further development through continued collaboration with the village government and relevant stakeholders.

For program development and sustainability, continuous mentoring is needed to strengthen the consistency of waste bank management and enhance the institutional capacity of partners in operating the established system. It is also recommended to expand community participation, both in terms of the number of households involved and the coverage of hamlet areas, so that program impacts can be felt more evenly. Other recommendations include further innovation development, such as enhancing digital waste bank system features, optimizing website utilization as an educational and transparency tool, and processing waste management outputs into economically valuable products. Thus, EcoRevolusi Sungai is expected to develop as a sustainable, adaptive, and replicable model of community service in addressing environmental issues at the village level.

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