

## Elaboration of the Independent Waste in the Circular Economy Based on Disapu Application

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### ARTICLE INFO

Date of entry:  
*30 July 2024*  
Revision Date:  
*28 August 2024*  
Date Received:  
*29 August 2024*

### ABSTRACT

Purworejo Village is one of the villages in Senduro District, Lumajang Regency, East Java Province. The village is facing significant waste management problems, most villagers are still lagging behind in environmental management, especially in waste management which still applies the KAB (Collect - Transport - Dump) pattern. This Community Service Program aims to invite the community to apply the 3R pattern (reduce, reuse, recycle) in processing household waste and educate the community with the support of technology developed based on web apps as an educational media and to overcome these problems. With the hope of increasing public awareness of the importance of managing waste, facilitating the waste sorting process, and encouraging the use of organic waste into liquid organic fertilizer and animal feed. The results of this community service are the formation of an application called Digital Sampah Purworejo (DISAPU) as an effective digital waste bank management media in organizing waste collection, increasing the economic value of waste, and the Independent Waste Community (MAMARISA) program receiving support. The implementation methods used in this community service are problem identification, solution formulation and program planning, training and mentoring, monitoring and evaluation of program sustainability.

Keywords: 3R, Community Service, Garbage, Waste Bank.



Cite this as: Asyari, H., Majid, M. D. A., Saifullah, M. F., & Hapsari, A. T. (2024). Elaboration of the Independent Waste in the Circular Economy Based on Disapu Application. *Empowerment Society*, 7(2), 107-114. <https://doi.org/10.30741/eps.v7i2.1358>

### INTRODUCTION

Indonesia is facing serious problems related to waste management. Data from 2020 shows that every day 270 million Indonesians produce an average of 185,753 tons of waste from a total national waste production of 67.8 million tons per year (Chrislawati, 2022). Along with population growth, the amount of waste produced is expected to continue to increase. To address this, the government has issued a policy aimed at reducing waste production by 30% through 3R efforts (reduce, reuse, recycle). This policy is stated in Government Regulation Number 97 of 2017 (*PERPRES No. 97 Tahun 2017*, n.d.).

Purworejo Village is one of the villages in Senduro District, data from the Lumajang Regency Environmental Service for the 2019-2023 period shows that Senduro District produces around 21,394.56 kilograms of waste every day (*Pencarian - Satu Data Lumajang*, n.d.). Of this amount, 40% is organic waste from household, market, and agricultural activities. Most of this organic waste is simply dumped into landfills without any further processing efforts, even though the waste has high potential economic value.

Purworejo Village is one of the villages in Senduro District, Lumajang Regency. Poor waste management in Purworejo Village has had a direct impact on the sustainability of the village environment, which threatens the increasing number of lands that are forced to be used as landfills, damaging the surrounding natural ecosystem and reducing the potential productivity of the land. This impact not only affects the health and welfare of the community, but also reduces the aesthetic value of the village, hinders local economic growth, and contributes to global environmental problems such as climate change. (*Pencemaran Lingkungan / A. Tresna Sastrawijaya / Perpustakaan Universitas Islam Negeri Sultan Syarif Kasim Riau*, n.d.; Yuli Handayani, 2011) defines waste as material that is no longer used, because its main part has been removed through processing, becoming a part that is not desired and economically has no value. The reason for choosing Purworejo Village as the location for service in the ORMAWA PPK program was based on critical conditions related to waste management. facing serious problems where waste is poorly managed, causing ecosystem damage, unproductive land use, and a decline in the quality of life of residents. Waste that accumulates without processing not only pollutes the environment, but also contributes to global problems such as climate change. (Hoornweg & Bhada-Tata, 2012)

In response to this problem, the UKM Jurnalistik Institut Teknologi Dan Bisnis Widya Gama Lumajang team presents a solution to resolve the problems in Purworejo Village through the PPK ORMAWA activity. The solution we offer is to increase participation, involvement, and public awareness in processing waste. The use of a web-based technology system can be developed as an effort to change the habit of the KAB pattern (collect, transport, dispose) to the 3R pattern (reduce, reuse, recycle) (Mahartin, 2023), through digital waste bank processing and conducting technical training for the community in processing organic waste into liquid organic fertilizer (POC) and maggot cultivation with the hope that the problem of waste in the surrounding environment will become an economic activity and increase the source of income for the people of Purworejo Village. It is hoped that this program will not only provide a short-term solution to the waste problem in Purworejo Village, but also inspire replication in other villages and contribute to sustainable development at the local level.

## METHODS

This community service was carried out in Purworejo Village, Senduro District, Lumajang Regency, which is  $\pm$  11.7 km from the city center of Lumajang Regency. The area of Purworejo Village is  $\pm$  3.12 km<sup>2</sup>. Community service activities were carried out from June to October 2024. The method of implementing this community service was carried out through several stages as follows:

a. Problem Identification

In the first stage, the community service implementation team conducted a direct survey in Purworejo Village to obtain information and find out the real conditions of the problems that arise in waste processing.

b. Formulating Solutions and Program Planning

After identifying problems through a survey, the next stage is to conduct audiences and discussions with stakeholders. In this forum, the formulation of solutions is obtained from various inputs from stakeholders so as to produce an activity plan that will be carried out to support the achievement of success indicators.

c. Training and Mentoring

Training and mentoring in the waste bank empowerment program in Purworejo Village were carried out in stages with a structured and participatory approach. The first stage carried out by the implementing team was socialization to the village community regarding the waste bank program. This activity aims to increase public awareness of waste problems and introduce the concept of waste banks and the principles of a circular economy. Furthermore, technical training was provided to the community participating in this program. The focus of the training was organic waste management, where the community was taught how to utilize household, market, and agricultural organic waste to produce products of economic value, such as liquid organic fertilizer (POC) and maggot cultivation. The material presented included fermentation techniques, making POC, and caring for maggots as animal feed. In addition, the community was also equipped with skills in using the Digital Sampah Purworejo (DISAPU) application. This training includes how to register, utilize application features, as well as access to information and exchange points that have been collected. Evaluation of community capacity building is carried out through the implementation of pre-tests and post-tests to measure their ability to optimize the use of web applications. This evaluation uses a combination of closed and open questions to obtain more comprehensive information. The main focus of this program is to empower communities through education related to web applications that involve optimizing waste management, waste management, and support from related partners. Through this approach, it is hoped that communities can be more efficient in utilizing digital technology to support environmental and waste management. The next stage is implementing the program plan to realize and increase public awareness and participation in managing waste independently and sustainably. The activities carried out include socialization regarding the importance of waste management, training in making recycled products, and developing a digital platform for waste bank management.

d. Evaluation the Programs

The success of the program can be measured by the number of registrants on the Disapu application as customers of the waste bank and the level of community participation in saving waste through the Disapu application.

## RESULTS AND DISCUSSION

Program Preparation the initial stage of PPK Ormawa activities in Purworejo Village consists of several activities aimed at thoroughly preparing each activity so that the output of the counseling and training carried out has a positive impact on the target partner group. The preparation stage of the activity includes an initial survey, problem identification, needs analysis, determination of work programs, target audiences, discussions with related agencies in waste management in the village.

The implementation team has interacted directly with the Head of Purworejo Village, Mr. Mokhamad Nyono, in February-March 2024. This interview aims to obtain information regarding the current situation of the village, especially regarding the waste problems faced. The output of the interview is that,

1. Finding the root of the problem of waste generation in the village
2. The community is not used to sorting waste
3. No Waste Bank management has been formed
4. Active groups in the village that can be used as target audiences
5. Still unfamiliar with organic waste management



**Figure 1. Audience with the Head of Purworejo Village**

From the results of the survey, an analysis was conducted to determine the priority scale of the problems to be solved in Purworejo Village. Furthermore, it is the stage of needs analysis which aims to determine the needs that will later be needed in solving the waste problems in Purworejo Village. The results of the needs analysis are the formation of a Waste Bank administrator as the person responsible for overcoming the waste problems in Purworejo Village (Iqbal et al., 2023), the development of the web app application Digital Sampah Purworejo (DISAPU) as a digital media for waste bank management (Nurfaldini & Aji, 2023), processing organic waste into real products in the form of liquid organic fertilizer (POC) and maggot cultivation. The target audiences involved are heads of households, youth organizations, farmer groups, and PKK mothers.

After that, we held a discussion forum with the Regional Government (PEMDA) of Lumajang Regency. With the aim of the PPK Ormawa program, we will later receive support from the relevant agencies so that our program with the village continues.



**Figure 2. Joint Discussion with PT and the Regional Government of Lumajang Regency**

The initial stage of the empowerment program begins with program outreach which aims to introduce and explain the web application-based Digital Waste House program to the community and Purworejo Village officials. This outreach is carried out so that the public can understand information related to the program well. Apart from introducing the program, education about the importance of starting to sort waste independently from home and how to process it is also an important part of this stage.



**Figure 3. Socialization Of The Work Plan**

Based the results of our discussions with village officials and field assistant lecturers (DPL), we agreed to form a Waste Bank management as an effort to continue the Digital Waste House program. On July 15, 2024, the Purworejo Village Government issued a Decree (SK). Based on the decision that has been determined, the new group that is formed will involve 10-15 cadres in carrying out the work program that we have designed.



**Figure 4. Formation of the DISAPU Waste Bank Management**

This training in making real products from organic waste is divided into two main parts: maggot cultivation and production of liquid organic fertilizer. Both provide a practical and applicable approach for the community, especially in utilizing organic waste produced daily.

Maggot Cultivation Purworejo Village residents were introduced to maggots (Black Soldier Fly larvae) which have high potential in decomposing organic waste (Tantalu et al., 2022). Maggots are able to decompose organic waste quickly and produce high protein that can be used as animal feed. Residents are taught how to prepare cultivation containers, select suitable types of organic waste, and manage optimal environmental conditions for maggot growth (Ahmad & Sulistyowati, 2021). After the cultivation period, participants learn maggot harvesting techniques and how to use maggots as animal feed or raw materials for other products.



Liquid Organic Fertilizer This training explains the process of fermenting organic waste into liquid fertilizer. Purworejo Village residents learn how to mix organic waste with decomposing microorganisms in a closed container. Residents are given an understanding of the quality standards of good liquid organic fertilizer and how to apply this fertilizer to plants to increase soil fertility and plant productivity(Sari et al., 2022).



**Figure 5. Training in Making Real Products from Waste**

The process of creating the DISAPU web app, we from the PPK Ormawa team, especially the developer division, carried out several stages, namely as follows:

1. **UI/UX Design:** The creation of our web app design uses design software, namely Figma, this process aims to provide an overview or prototype in creating a web app, in making this design, we pay attention to all guidelines for intuitive, logical, easy-to-use and attractive human psychology.
2. **Database Design:** After creating the UI/UX design, our members start compiling the Database design which aims to organize all organized and structured data storage. With good design, we hope that the application can run efficiently, data is stored safely, and information can be accessed quickly(Muller, 1999). At this stage, we, the PPK Ormawa team, also pay attention to how the components are connected to each other.
3. **Front End Development:** Members of the PPK Ormawa team compile the code using Visual Studio Code software, this coding is done based on the design that has been made using the PHP and Javascript programming languages with the Models Views Controllers (MVC) architecture to build an interactive user interface(Permana & Sihanato, 2024). In this stage we also use the concept of Progressive Web App (PWA) which functions to provide a user experience similar to native applications.
4. **Back End Development:** The next stage is the creation of a back end that functions to run the web and connect to a previously designed database, in this technology we use technology, namely PHP Data Object (PDO) but for database technology we use MySQL.
5. **Publication:** The last stage is to publish the Digital Sampah Purworejo (DISAPU) application with the disapu.com domain at a hosting service provider in Indonesia.



**Figure 6. Development of the Digital Sampah Purworejo (DISAPU) Application**

We conduct training related to how to use the DISAPU application. In addition, we also demonstrate the use and creation of DISAPU application customer accounts. Through the Digital Waste House Program. Purworejo Village has succeeded in having a digital waste house processing system based on a web app. This is shown through the residents of Purworejo Village who have started trying to sort waste that has economic value to be collected at the digital waste house. The collected waste is integrated into the DISAPU web app where each community transaction will get points according to the classification and quantity of waste collected. This makes the community more enthusiastic about collecting their waste. As many as 12% of village heads have become customers of the DISAPU digital waste house.

## CONCLUSION

The UKM Journalism PPK Ormawa Program of the Widya Gama Lumajang Institute of Technology and Business, which was implemented in Purworejo Village, Senduro District, Lumajang Regency, succeeded in providing concrete solutions to waste management problems in the village and starting a new habit from KAB (Collect, Transport, Dispose) to the habit of implementing the 3R pattern (Reduce, Reuse, Recycle) which is supported by the existence of a Waste Management Site Reuse, Reduce, and Recycle (TPS 3R)(*Pengelolaan Sampah Pada Bank Sampah*, n.d.). Through a technology-based approach and community empowerment, this program not only increases public awareness of the importance of waste management, but also processes waste into real products by converting organic waste into products with economic value, such as liquid organic fertilizer and maggots. The training provided to the community regarding maggot cultivation and liquid organic fertilizer production has succeeded in equipping participants with practical skills that can be directly applied in everyday life.

The use of the Digital Sampah Purworejo (DISAPU) application as a digital platform for waste management has proven effective in regulating and monitoring waste transportation at the village level, thereby increasing efficiency and community participation in the program. Overall, this program shows that with the right approach and strong collaboration between stakeholders, waste management can be an opportunity to improve community welfare and preserve the environment in a sustainable manner. Suggestions for further research are to develop implementation methods to implement efforts to increase the level of community participation in waste management.

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