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The Role of Waste Bank-Based Waste Management Engineering in Women's Empowerment to Achieve SDGs 5 and 12

Putri Ratna Setyowati[1], M. Noviansyah Aridito[2], Febriyanti Angelia Ginting[3], Trisno Fallo[4], Gangsar Edi Laksono[5]
[1,2,3,4] Environmental Engineering, Engineering Faculty, Universitas Proklamasi 45
[5]Environmental Science, Science and Technology Faculty, UIN Prof. K.H. Saifuddin Zuhri Purwokerto
[1]putriratnasetyo@up45.ac.id

Abstract

Waste banks are one of the community-based waste management approaches that not only contribute to reducing waste generation, but also have the potential to be a means of empowering women. This study aims to analyze the waste management engineering model based on the Gondangan Sejahtera Waste Bank in women's empowerment to support the achievement of Sustainable Development Goals (SDGs) 5 and 12. The research uses a descriptive qualitative method by collecting data through field observations, in-depth interviews, and questionnaires to waste bank administrators and customers. The data was analyzed in a qualitative descriptive manner, while the questionnaire results were used as supporting data through percentage analysis. The results of the study show that the waste management engineering model consists of six stages, namely waste sorting from sources, composting organic waste, depositing inorganic waste, recording transactions digitally, making creative products from recycling, and implementing a green circular economy. All stages are carried out with the active involvement of women as the main actors so as to increase women's participation, capacity, leadership, and economic independence. In addition, the implementation of waste sorting, reducing, reusing, and recycling encourages changes in people's behavior towards more responsible consumption and production. Thus, the waste management engineering model based on the Gondangan Sejahtera Waste Bank not only supports sustainable waste management, but also contributes to the achievement of SDGs 5 through women's empowerment and SDGs 12 through the application of the principles of responsible consumption and production.

Keywords: waste bank, waste management, SDGs 5, SDGs 12, Circular economy

1. Introduction

The problem of waste management in Indonesia is still a complex and urgent environmental issue. Population growth, urbanization, and increased public consumption activities have caused a surge in waste generation in various regions. This complexity also occurs in the Special Region of Yogyakarta (DIY), where management problems are increasingly evident as the volume of waste increases and the limited capacity of regional waste management. Based on data on the National Waste Management Information System (SIPSN) page from 2020 to 2024, the waste generated per day produced from DIY is 1,237.25 tons/day; 1,240.10 tons/day; 1,894.34 tons/day; 1,950.92 tons; 1,940.71 tons/day [1]. This condition shows a trend of increasing waste volume every year, which indicates the need for more adaptive and sustainable management system innovation.

The problem is further exacerbated by the limited capacity of the Piyungan Final Disposal Site (TPA), which is the only major landfill in the DIY area and parts of Sleman, Bantul, and Yogyakarta Regency. This landfill was closed several times before it was finally announced as a permanent closure as of May 1, 2024 by the Yogyakarta Government, as reported by Detik Jogja news on April 29, 2024 [2]. This is due to excess capacity and social conflicts with the community around the landfill. This condition has serious implications for waste management, urban cleanliness, and the potential for water and air pollution due to the accumulation of waste that is not properly managed. On the other hand, the supply of waste to the Yogyakarta Waste into Electrical Energy (PSEL) has reached more than 1,400 tons per day, this shows that the final disposal system is no longer able to accommodate the increasing volume [3].

From an environmental engineering perspective, this situation shows that the traditional waste management model that relies on landfills is increasingly inadequate. Systems that focus on collection and disposal without reduction in source, recycling, or sustainable use, have resulted in a large environmental and economic burden. For example, quoted data from SIPSN, national waste handling in 2024 will only reach around 31–33% of total generation [4].

In the social and economic context, community involvement in waste management is crucial. One of the strategies that is growing is the development of a

community-based waste bank system, where waste of economic value (especially inorganic) is collected, sorted, and remanaged by involving residents. Data from the Ministry of Environment of the Republic of Indonesia (KLH RI) recorded more than 27,000 units of waste banks in Indonesia that have been operating as of October 2025, while in DIY alone there are 648 unit waste banks [5].

Nevertheless, although many studies have highlighted the existence of Waste Banks, there is still a research gap especially in terms of technical engineering of waste management coordinated with women's empowerment, especially in areas such as DIY that are unique in terms of demographics, culture, and tourism. Women are often informal managers of domestic waste management, but their structural empowerment in environmental engineering systems has not been extensively reviewed. One example of a waste bank managed by women is the Gondangan Sejahtera Waste Bank.

The Gondangan Sejahtera Waste Bank is one of the waste management units that has been active since 2022 and has become a model for driving the circular economy at the community level. The activities carried out include sorting organic and inorganic waste, scheduled collection, weighing, recording customer balances, and selling sorted waste to large collectors [6]. In addition, waste banks can play a role in reminding the public to consume something responsibly, which is in line with SDGs 12 regarding Responsible Consumption and Production. Interestingly, most of the managers and customers of this Waste Bank are women, who play an active role in collecting, managing, and making decisions related to the finances of sales results. This shows the great potential of women's empowerment in a community-based waste management system that is in line with SDGs 5, namely Gender Equality.

The novelty *of* this research lies in the integration of environmental engineering *approaches*, such as the optimization of sorting systems, collection flows, and the efficiency of the waste logistics chain, of course, with the strategy of empowering women through capacity building, managerial training, and strengthening the leadership role in the management of the Waste Bank. This approach is expected to be a model for implementing community-based sustainable waste management that not only addresses technical issues, but also supports the achievement of SDGs 5 (Gender Equality) and SDGs 12 (Responsible Consumption and Production) at the local level. Due to the background and *gap research*, this study is directed to (a) identify the flow and model of waste management engineering that has been applied by the Gondangan Sejahtera Waste Bank in supporting sustainable waste management at the community level, (b) analyze the role and contribution of women in the waste management engineering system at the Gondangan Sejahtera Waste Bank, and the extent to which these activities have an effect on improving the quality of the waste management system. their capacity and economic empowerment, and (c) examine the role of waste management engineering based on the Gondangan Sejahtera Waste Bank in contributing to the achievement of the 5th Sustainable Development Goals (SDGs) on Gender Equality and the 12th SDGs on Responsible Consumption and Production.

2. Research Method

This study uses a descriptive qualitative approach to describe the flow and engineering model of waste bank-based waste management in women's empowerment to support the achievement of Sustainable Development Goals (SDGs) 5 and 12. This approach was chosen because it was able to describe in depth the waste management process, the form of women's empowerment, and the relationship between the two in the context of society.

The research was carried out at the Gondangan Sejahtera Waste Bank, Padukuhan Gondangan, Sardonoharjo Village, Special Region of Yogyakarta. The research informants were selected *purposively*, including waste bank administrators and members (customers) who were actively involved in waste management activities.

Data was collected through three techniques, namely observation, in-depth interviews, and questionnaires. Observations were carried out directly to identify the flow of activities and develop a waste bank-based waste management engineering model. In-depth interviews were conducted with 12 female administrators and customers to obtain information about the waste management process, forms of women's empowerment, perceived benefits, and their contribution to the achievement of SDGs 5 and 12. In addition, questionnaires were given to 12 female administrators and 132 waste bank customers to obtain supporting data on perceptions, participation rates, and assessments of the impact of waste bank activities.

Data analysis is carried out in a qualitative descriptive manner through the stages of data reduction, data presentation, and conclusion drawn. The observation and interview data were analyzed thematically to produce a flow and engineering model of waste management, while the questionnaire results were analyzed using descriptive statistics in the form of percentages to strengthen the interpretation of qualitative findings. The validity of the data was maintained through triangulation techniques by comparing the results of observations, interviews, and questionnaires.

3. Results and Discussion

3.1 Results

3.1.1 Environmental Management Engineering at the Gondangan Sejahtera Waste Bank

Chart 1 below illustrates the flow and engineering model of waste management based on the Gondangan Sejahtera Waste Bank in empowering women to achieve SDGs 5 and 12. Where all stages are carried out by women and based on the 3R principle.

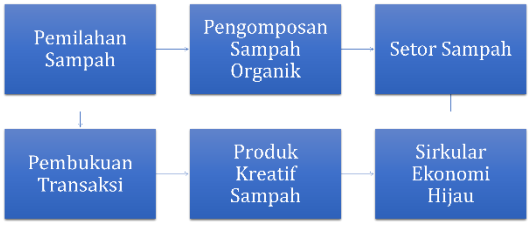

Chart 1. Environmental Management Engineering at the Gondangan Sejahtera Waste Bank
Source: Primary Data Analysis

1. Organizational Structure

The organizational structure of the Gondangan Sejahtera Waste Bank is presented in Chart 2 below, which consists of two protectors who are policy makers from the government, then 14 administrators representing all groups in Padukuhan Gondangan.

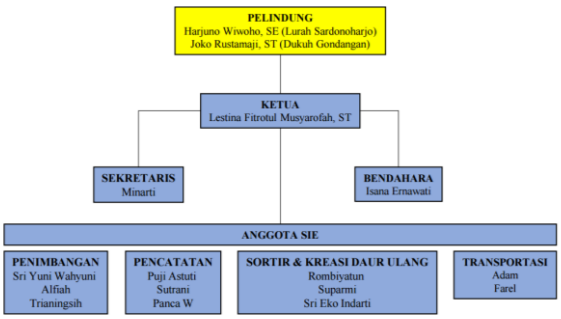

Chart 2. Organizational Structure of the Gondangan Sejahtera Waste Bank
Source: Primary Data Analysis

3.1.3 Number of Women in the Gondangan Sejahtera Waste Bank

The demographic picture of gender in the management of the Gondangan Sejahtera Waste Bank can be seen in Figure 1, where 12 people (86%) are women and only 2 people (14%) are men. As for the 150 customers, all of them are female.

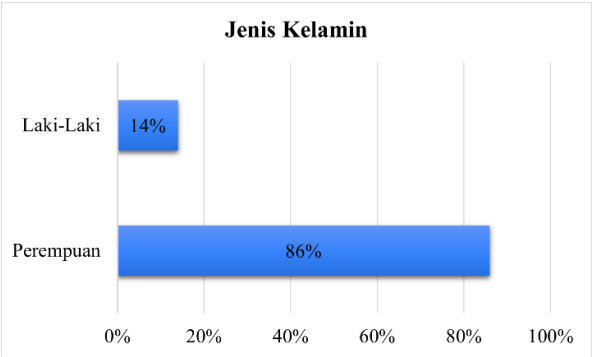

Figure 1. Gender of Gondangan Sejahtera Waste Bank Manager
Source: Primary Data Analysis

3.1.4 Age Level

Figure 2 shows the age level of the female management of the Gondangan Sejahtera Waste Bank, where 41.67% are over 50 years old, 41.67% are 41-50 years old, 8.33% are 31-40 years old, and 8.33% are less than 20 years old.

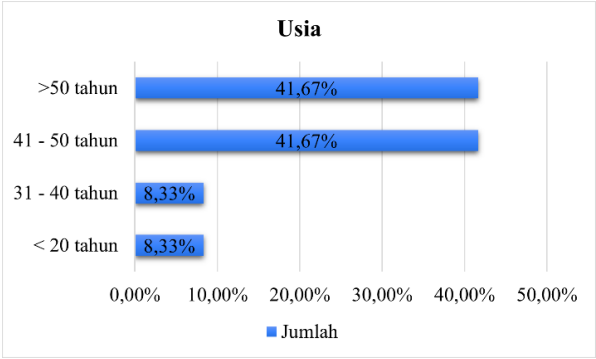

Figure 2. Age Level of Female Managers of Gondangan Seprosperous Waste Bank
Source: Primary Data Analysis

3.1.5 Length of Membership in the Waste Bank

Figure 3 shows how long it took for female administrators of the Gondangan Sejahtera Waste Bank to join the membership. A total of 66.67% have joined since the last three years while a total of 33.33% have joined for more than three years.

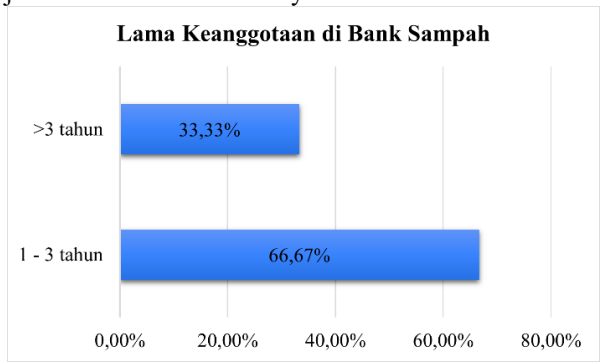

Figure 3. Long Joined the Female Management of the Gondangan Sejahtera Waste Bank
Source: Primary Data Analysis

3.1.6 Participation in Waste Bank Management Decision-Making

Figure 4 shows how often they participate as women in making decisions about the management of the Gondangan Sejahtera Waste Bank. A total of 41.67% stated that they participated often, 33.33% stated that they participated very often, while a total of 25% stated occasionally.

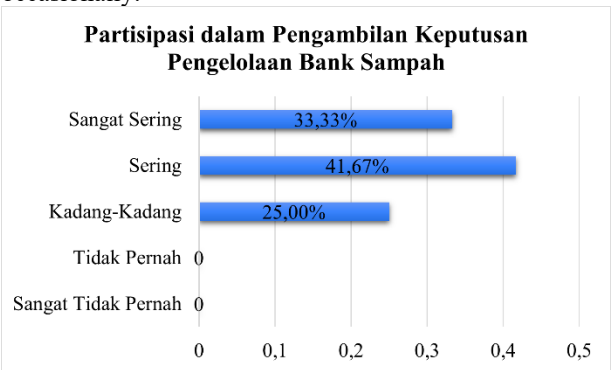

Figure 4. Participation in Waste Bank Management Decision-Making
Source: Primary Data Analysis

3.1.7 Accessibility and Improvement of the Latest Knowledge and Skills on Waste Management through Waste Banks

Figure 5 shows how often and openly the Gondangan Sejahtera Waste Bank is in accessibility and increasing the latest knowledge and skills about waste management, where 50% of customers stated very often, 41.67% stated often, and 8.33% stated occasionally.

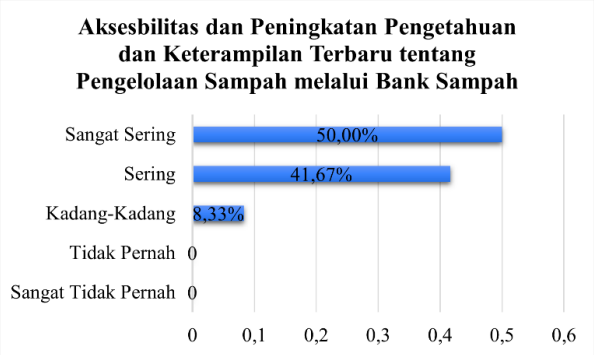

Figure 5. Accessibility and Improvement of the Latest Knowledge and Skills on Waste Management through Waste Banks
Source: Primary Data Analysis

3.1.8 Transaction Contribution to Waste Banks in Increasing Additional Income

Figure 6 shows how much contribution and usefulness savings transactions at the Gondangan Sejahtera Waste Bank contribute to additional income for women, where 58.33% of customers stated that they contributed very much, 33.33% stated that they contributed, while 8.33% stated that they did not contribute.

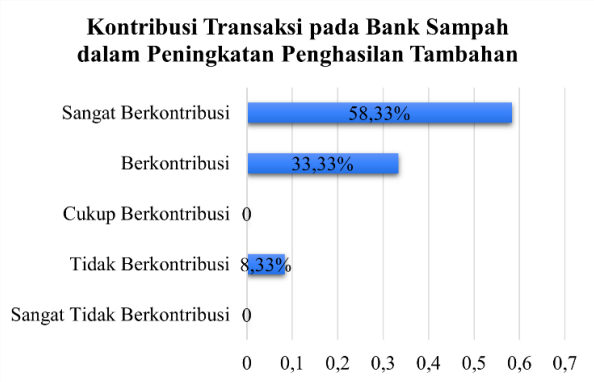

Figure 6. Transaction Contribution to Waste Banks in Increasing Additional Income
Source: Primary Data Analysis

3.1.9 Increasing Economic Independence for Women

Figure 7 shows an increase in economic independence for women after joining the Gondangan Sejahtera Waste Bank, where 50% said it had increased, 33.33% had said it had increased, 8.33% had said it had increased, and 8.33% had not increased.

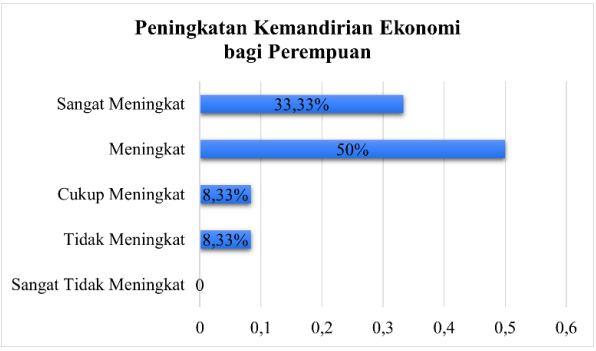

Figure 7. Increasing Economic Independence for Women
Source: Primary Data Analysis

Increasing Women's Confidence in Community Social Activities

Figure 8 shows whether there is an increase in women's confidence in community social activities after joining the activities of the Gondangan Sejahtera Waste Bank. A total of 50% stated that it increased, a total of 33.33% stated that it increased very much, while a total of 16.67% stated that it was quite increased.

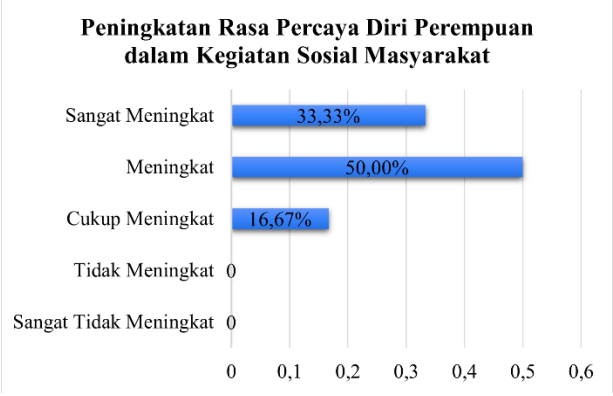

Figure 8. Increasing Women's Confidence in Community Social Activities
Source: Primary Data Analysis

3.1.10 Habits of Sorting Waste from Home

Figure 9 shows how often the habit of sorting waste from the homes of customers of the Gondangan Sejahtera Waste Bank is. A total of 58.33% stated that they often, 25% stated that they always sorted waste from home, while 16.67% stated sometimes.

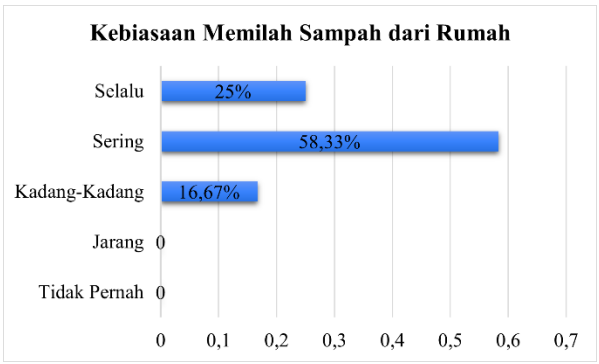

Figure 9. Habits of Sorting Garbage from Home
Source: Primary Data Analysis

3.1.11 Level of Understanding of Waste Types

Figure 10 shows the level of understanding of the female management of the Gondangan Sejahtera Waste Bank regarding the type of waste. A total of 58.33% stated that they understood the type of waste, 33.33% stated that they understood very well, while a total of 8.33% stated that they understood enough.

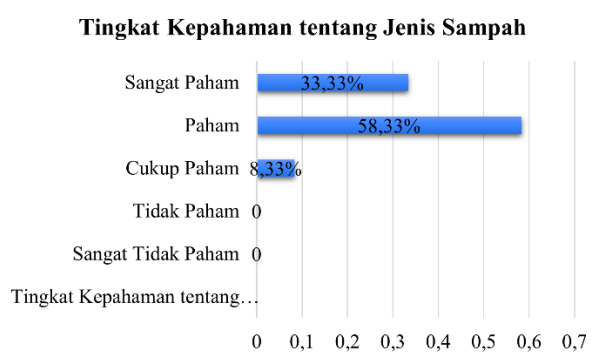

Figure 10. Level of Understanding of Waste Types
Source: Primary Data Analysis

3.1.12 Reduction in the Use of Single-Use Plastics

Figure 11 shows how often the attitude of reducing the use of single-use plastics is among female administrators at the Gondangan Sejahtera Waste Bank. A total of 58.33% of customers stated that they often reduce the use of single-use plastics, 16.67% stated always, 16.67% stated occasionally, while 8.33% stated rarely.

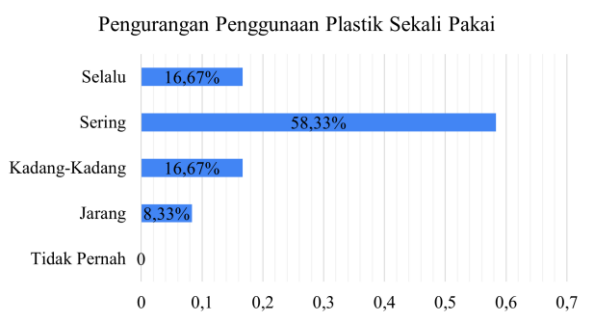

Figure 11. Reduction in the Use of Single-Use Plastics
Source: Primary Data Analysis

3.1.13 The Level of Ease of the Waste Bank System to Understand

Figure 12 shows how easy the system at the Gondangan Sejahtera Waste Bank is to be understood by female administrators. A total of 66.67% stated that it was easy to understand, 16.67% stated that it was very easy, while a total of 16.67% stated that it was quite easy.

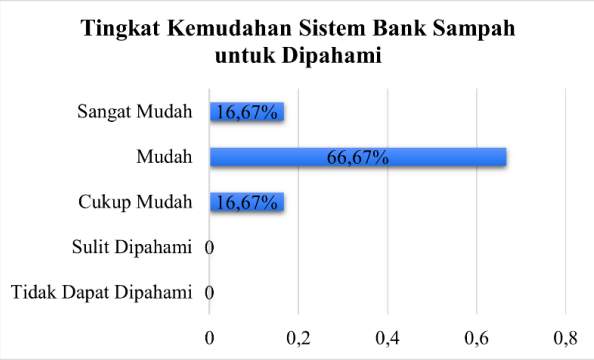

Figure 12. The Level of Ease of the Waste Bank System to Understand
Source: Primary Data Analysis

3.1.14 The Role of Waste Banks in Supporting Environmental Management

Figure 13 shows how much the Gondangan Sejahtera Waste Bank plays in supporting sustainable environmental management. A total of 66.67% of customers stated that the Gondangan Sejahtera Waste Bank plays a role in sustainable environmental management, 16.67% stated that it plays a very important role, while a total of 16.67% stated that it plays a considerable role.

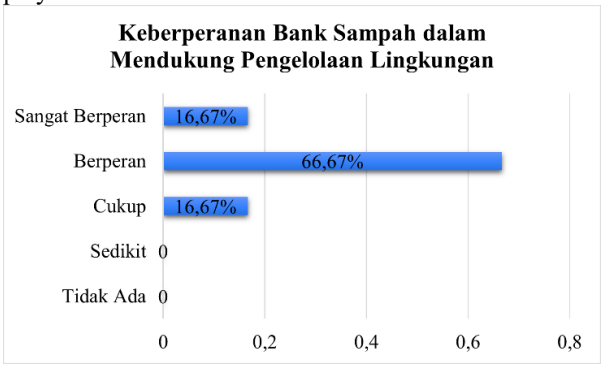

Figure 13. The Role of Waste Banks in Supporting Environmental Management
Source: Primary Data Analysis

3.1.15 The Role of Waste Banks in Helping to Reduce Waste in the Environment

Figure 14 shows how much the role of the Gondangan Sejahtera Waste Bank in helping to reduce waste in the environment, especially in Padukuhan Gondangan. 50% of customers stated that they played a very important role in reducing waste in the environment, while the other 50% stated that they played a role.

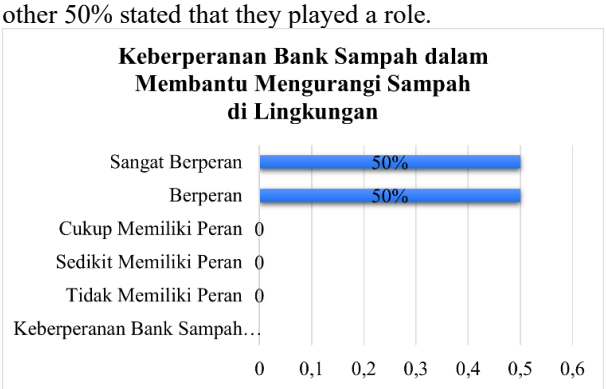

Figure 14. The Role of Waste Banks in Helping to Reduce Waste in the Environment
Source: Primary Data Analysis

3.1.17 The Influence of Waste Bank Activities on Community Environmental Concern

Figure 15 shows the influence of the activities of the Gondangan Sejahtera Waste Bank on the community's environmental concern, where 58.33% of customers stated that the activities of the Gondangan Sejahtera Waste Bank had an effect on increasing the community's environmental awareness, while 41.67% stated that it was very influential.

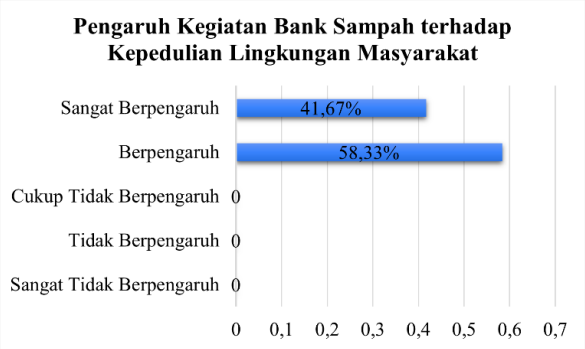

Figure 15. The Influence of Waste Bank Activities on Community Environmental Concern
Source: Primary Data Analysis

3.1.18 The Positive Influence of Waste Bank Activities for Families

Figure 16 shows the positive influence of the activities of the Gondangan Sejahtera Waste Bank for families, where 58.33% of customers stated that it had a positive effect, 33.34% stated that it had a very positive effect, and a total of 8.33% stated that it had a positive effect.

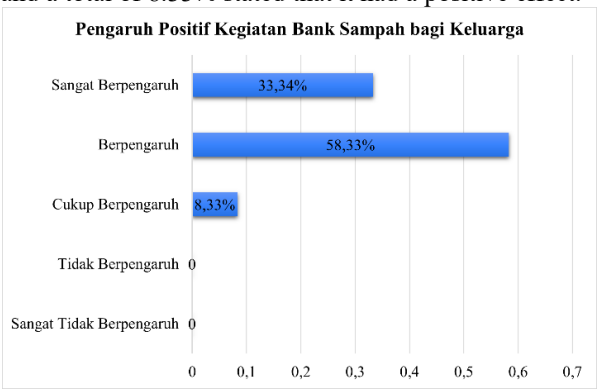

Figure 16. The Positive Influence of Waste Bank Activities for Families
Source: Primary Data Analysis

3.1.19 Activeness in Activities at the Waste Bank

Figure 17 shows the activeness of customers in activities at the Gondangan Sejahtera Waste Bank. A total of 41.67% stated that they were very active in activities at the Gondangan Sejahtera Waste Bank, 25% stated that they were active, 16.67% stated that they were quite active, 8.33% stated that they were inactive, while 8.33% stated that they were very inactive.

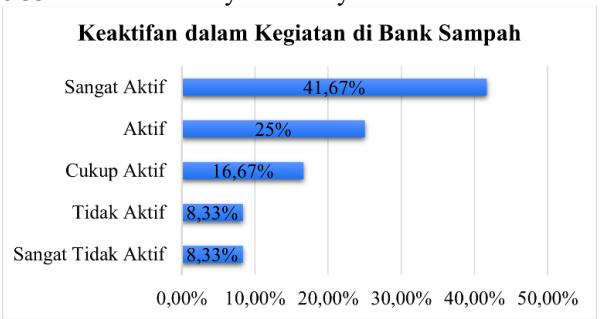

Figure 17. Activeness in Activities at the Waste Bank
Source: Primary Data Analysis

3.2. Discussion

3.2.1 Waste Bank-Based Waste Management Engineering Flow and Model in Women's Empowerment for the Achievement of SDGs 5 and 12

Based on the principle of mutual cooperation, the Gondangan Sejahtera Waste Bank was developed as an alternative waste management to reduce waste generation while increasing economic benefits for the community [6]. The waste bank-based waste management engineering model acts as an integrative instrument that combines environmental, social, and economic aspects. The involvement of women's participation in the organization and operation of the Gondangan Sejahtera Waste Bank shows its contribution to increasing the capacity and leadership role of women at the community level, which is in line with the SDGs 5 targets. On the other hand, the implementation of waste reduction, sorting, and recycling practices through waste bank mechanisms supports the achievement of SDGs 12 which emphasizes sustainable consumption and production patterns. Thus, this model not only has an impact on environmental management, but also on social empowerment and transformation of people's behavior. After field observations, **Chart 1** was produced which is a flow and engineering model of waste management at the Gondangan Sejahtera Waste Bank based on the waste bank in empowering women for the achievement of SDGs 5 and 12.

First, waste is sorted from home, which is divided into inorganic and organic. Data in the field shows that the inorganic waste that is usually produced by customers of the Gondangan Sejahtera Waste Bank is goods made of plastic and paper, while organic waste is cooking and food waste. The benefits of waste sorting starting from home can reduce the burden on TPS3R [7]. According to the results of an interview with the management of the Gondangan Sejahtera Waste Bank, the activity of sorting waste is a mandatory routine of customers, even from this sorting activity customers can measure how much waste from the results of consumption.

Second, both customers and administrators compost organic waste that has been sorted. This composting is carried out independently. Research from Sawir et al. [8] states that composting organic waste not only provides environmental benefits but also the economy, namely through the selling value of the organic fertilizers produced. This is in line with findings in the field that organic fertilizers produced by customers of the Gondangan Sejahtera Waste Bank have been traded even though the scope is not yet wide. In fact, this compost fertilizer reduces the consumption of chemical fertilizers in the community based on the story of one of the following customers:

"Kami sekarang tidak lagi membeli pupuk kimiawi jika ingin memupuk kebun mini yang di halaman rumah, cukup pakai kompos sendiri, sudah sangat cukup".

Third, waste deposit activities from customers to the Gondangan Sejahtera Waste Bank are carried out once a month. Gondangan Sejahtera Waste Bank accepts inorganic waste that has been sorted by customers. This waste deposit activity has a unique mechanism in order to be efficient in time and fuel consumption, namely by collecting at certain points and then being picked up by the management of the Waste Bank using a transport vehicle.

Fourth, namely transaction bookkeeping. One of the new innovations is bookkeeping through digital applications. This digital recording is carried out to make it more environmentally friendly based on a statement from the chairman of the Gondangan Sejahtera Waste Bank:
"Pencatatan secara digital via aplikasi ini harapannya supaya tidak lagi pakai kertas, ini cara kita menekan konsumsi pohon secara tidak langsung"
In addition, this digital recording is more transparent because customers can see directly the balances and mutations made.

Fifth, the manufacture of creative waste products. Customers and managers jointly produce creative products from waste. Based on the results of the interviews, the products produced are eco-bricks, chairs, wall and table decorations, bags, wallets, tablecloths, aprons, and even compost fertilizer for souvenirs if you visit the waste bank. In fact, according to the customer's statement, the waste bank stated that this makes the environmental movement more interesting to follow:
"Pembuatan kerajinan dari sampah ini membuat saya khususnya semakin sadar dan tertarik untuk cinta lingkungan"
Research conducted by Wijayanti et al. [9] also revealed that making products from waste generated daily can build awareness of environmental love.

Sixth, the implementation of the green circular economy. This is reflected in the use of waste as a source of economic value for the community. Customers benefit financially from depositing inorganic waste into the waste bank. In addition, at the household level, the community also gets additional income through the sale of compost fertilizer produced from organic waste processing and the implementation of wiser consumption patterns. On the other hand, various creative products from recycled products produced by waste banks have a selling value so that they can be marketed. The revenue obtained from the sale of the product is then distributed to customers in accordance with the established profit-sharing mechanism. Client accounts from field interviews stated:
"Bergabung dengan bank sampah membuat saya memiliki penghasilan tambahan, lumayan untuk tabungan lebaran dan beli kebutuhan dapur"
Women involved in waste bank activities not only play a role in the technical aspects of environmental management, such as sorting waste from the source, but also contribute to improving the family economy through the financial benefits obtained from waste savings. The results of this study have similarities with the research of Selviani and Sunarto [10] that one of the roles of waste banks for women is to improve economic welfare.

On the other hand, the waste management engineering system applied at the Gondangan Sejahtera Waste Bank contributes to making it easier for the management to carry out each stage of the waste bank's operations. This can be seen in **Figure 12**, which shows that 75% of female managers stated that the system implemented is easy to understand and facilitates the waste management process deposited by customers. These findings show that a structured management system not only improves the operational effectiveness of waste banks, but also supports women's involvement in carrying out waste management tasks more efficiently.

3.2.2 The Role and Contribution of Women in the Waste Management Engineering System at the Gondangan Sejahtera Waste Bank

According to archives recorded in Sardonoharjo Village, the Gondangan Sejahtera Waste Bank was established in 2022 as a form of community involvement in preserving the environment, with a focus on the active role of women. This program was initiated by Mrs. Lestina Fitrotul Musyarofah, ST., who serves as the Chairperson of Family Empowerment and Welfare (PKK) of Padukuhan Gondangan, Sardonoharjo Village, Special Region of Yogyakarta. According to Dwiyanti et al. (2025), organizations with a clear and non-complex structure are able to facilitate the implementation of programs so as to contribute to the effectiveness of implementation and the success of sustainable waste management in a Waste Bank [11]. This has been implemented at the Gondangan Sejahtera Waste Bank shown in **Chart 2**.

Women have a central role in the management of the Gondangan Sejahtera Waste Bank. This can be seen in **Figure 1**, where as many as 86% of the management and 100% of the customers are women. These findings show that women are the main actors in the establishment and sustainability of the Gondangan Sejahtera Waste Bank. Women's involvement also comes from various age groups, ranging from less than 20 years old to more than 50 years old, as seen in **Figure 2**. This shows that women's participation in waste bank management involves cross-generationality. This finding is in line with research that has been conducted by Solihah [12] that productive age affects community participation as waste bank customers.

Women's commitment in running the Gondangan Sejahtera Waste Bank program is relatively high. This can be seen in **Figure 4**, which shows that all active customers have joined for more than a year. The length of the involvement reflects the consistency of women's participation in supporting the sustainability of the program. These findings are in line with research by Abdillah and Virianita [13] which states that the level of community participation is significantly and positively related to the sustainability of the program. Thus,

women play a role as the main driving force in maintaining the sustainability of the Gondangan Sejahtera Waste Bank.

The next role of women is as the main determinant in waste sorting activities in households. Women generally have a larger proportion of domestic work so they better understand the characteristics and types of waste produced at home. This condition supports women in sorting waste according to its type before it is deposited into the waste bank. This can be seen in **Figure 9** and **Figure 10**, which show that more than 80% of customers have sorted waste and understood the types of waste produced. This finding is in line with the opinion of Wijayanti and Utami [14] who stated that knowledge is a fundamental factor in shaping a person's behavior, including waste management behavior. Thus, the knowledge possessed by women contributes to the accuracy of waste sorting as the first step in realizing more effective waste management.

Furthermore, women not only play a role in the technical aspects of waste management, but also in various non-technical aspects in the management system of the Gondangan Sejahtera Waste Bank. This role includes administrative activities, recording transactions, preparing work programs, and being the draftsman of various activities carried out by the Gondangan Sejahtera Waste Bank. This shows that women have a comprehensive contribution, from operational implementation to program planning and development. The findings were strengthened by the results of an interview with the Chairman of the Gondangan Sejahtera Waste Bank as follows:
"Perempuan memiliki banyak andil dalam berjalannya bank sampah, untuk memilah dan mengompos sampah. Bahkan untuk pelayanan pencatatan via aplikasi sampai acara-acara pun ibu-ibu yang melakukan"

Lastly, women play the role of the first educators in the family who instill values, knowledge, and habits in the next generation. In the context of environmental management, a mother plays an important role in shaping positive behavior of children through the habit of sorting and managing waste at home. This can be seen in **Figure 5**, which shows that the Gondangan Sejahtera Waste Bank provides access to knowledge about environmental management to its members. The impact of this increase in knowledge is also seen in **Figure 16**, which shows that the knowledge and practices of environmental management obtained through the Gondangan Sejahtera Waste Bank are also applied in the family environment. These findings show that women become agents of knowledge transfer and environmentally friendly behavior from waste banks to families, so that the benefits of the program are not only felt by individuals, but also extend to the household level. These results are in line with the research of Gatta et al. [15] who stated that women, especially housewives, have a strategic role as drivers of change in the family through instilling habits of waste reduction and management as well as the formation of environmentally friendly behaviors in a sustainable manner.

3.2.3 The Role of Waste Management Engineering Based on the Gondangan Sejahtera Waste Bank Contributes to the Achievement of the 5th Sustainable Development Goals (SDGs) on Gender Equality and the 12th SDGs on Responsible Consumption and Production

Further findings in this study show that the Gondangan Sejahtera Waste Bank not only plays a role as a community-based waste management system, but also as a means of empowering women through increasing participation, capacity, and leadership in environmental management. The various roles carried out by women, ranging from the operational management of waste banks, waste sorting at the household level, the preparation of programs, to the transfer of knowledge to family members, show that the existence of waste banks produces benefits that go beyond environmental aspects. This condition indicates that waste management engineering based on the Gondangan Sejahtera Waste Bank has contributed to the achievement of the Sustainable Development Goals (SDGs), especially SDGs 5 on Gender Equality through strengthening the role and empowerment of women, and SDGs 12 on Responsible Consumption and Production through the implementation of sustainable waste reduction, sorting, and reuse practices.

The contribution of the Gondangan Sejahtera Waste Bank to the achievement of SDG 5 on Gender Equality can be seen from the high involvement of women in the management of the waste bank. This can be seen in **Figure 1**, which shows that 86% of managers and 100% of customers are women. The high participation is also reflected in **Figure 17**, where 66.67% of female administrators play an active role in various waste bank activities, and in Figure 4 which shows that 75% of female administrators are often involved in decision-making. In addition, **Figure 8** shows that 83.33% of female administrators stated that activities at waste banks were able to increase confidence. These findings show that the Gondangan Sejahtera Waste Bank is not only a forum for women's participation, but also encourages increasing women's capacity, leadership, and confidence in environmental management.

The contribution to SDG 5 can also be seen from the aspect of women's economic empowerment. This can be seen in **Figure 7**, which shows that 88.33% of respondents stated that waste banks are able to increase women's economic independence. In addition, **Figure 6** shows that 96.66% of female administrators stated that transaction activities at waste banks provided additional economic income. These findings show that the Gondangan Sejahtera Waste Bank not only strengthens the role of women in environmental management, but also increases economic independence as a form of women's empowerment. These results are in line with the research of Rakhman et al. [16] who stated that

strengthening the role of women in waste management activities directly supports the achievement of SDGs 5 and SDGs 11–13 as part of sustainable development efforts at the community level. Thus, the high participation of women, capacity building, and strengthening of economic independence produced through the Gondangan Sejahtera Waste Bank show that women's empowerment is one of the strategies that contribute to the achievement of SDGs 5.

In addition to contributing to the achievement of SDGs 5, waste management engineering based on the Gondangan Sejahtera Waste Bank also supports the achievement of SDGs 12 on Responsible Consumption and Production. This contribution can be seen from changes in people's behavior towards wiser consumption patterns in reducing waste generation. The existence of waste banks serves as a reminder for consumption for the public to consider the environmental impact of each product used, especially by reducing the use of single-use items that have the potential to increase the earth's burden due to accumulated waste. This awareness encourages people to implement more responsible consumption behavior as a form of concern for environmental sustainability.

This change in behavior can be seen in **Figure 11**, which shows that 75% of Gondangan Sejahtera Waste Bank customers have reduced the use of single-use plastics. In addition, **Figure 13** shows that all members agree that the existence of a Waste Bank can reduce waste in the environment. This is strengthened by **Figure 14**, which shows that 83.33% of members stated that the Waste Bank plays a role in supporting sustainable environmental management, and **Figure 15** which shows that all members stated that the existence of the Waste Bank was able to increase public concern for the environment. These findings show that the Gondangan Sejahtera Waste Bank not only plays a role in the technical aspects of waste management, but also becomes an educational tool that builds environmental awareness and forms more responsible consumption behavior. Thus, the existence of the Gondangan Sejahtera Waste Bank supports the achievement of SDGs 12 through efforts to reduce waste from the source, increase environmental awareness, and change people's consumption patterns towards sustainability.

The Gondangan Sejahtera Waste Bank not only functions as a community-based waste management system, but also as a means of women's empowerment that supports the achievement of SDGs 5 through increasing women's participation, capacity, leadership, and economic independence. In addition, the implementation of waste sorting, reducing, and reusing practices as well as increasing public awareness of responsible consumption shows the contribution of the Gondangan Sejahtera Waste Bank to the achievement of SDGs 12. Thus, waste banks become a model that integrates social, economic, and environmental aspects in realizing sustainable development.

4. Conclusion

The flow and engineering model of waste management based on Waste Bank in empowering women for the achievement of SDGs 5 and 12 consists of six stages, namely waste sorting, composting, depositing inorganic waste, digital bookkeeping, creative product creation, and implementing a green circular economy. All stages are carried out with the active involvement of women as the main actors so as to provide social and economic benefits that support the achievement of SDGs 5. In addition, this model is based on the principle of responsible consumption and production through waste sorting, reuse, and recycling, thus contributing to the achievement of SDGs 12.

Women play a key role in the management of the Gondangan Sejahtera Waste Bank, starting from operational management, administration, program planning, to environmental management education at the family level. Cross-generational involvement, consistency of participation, and the role of women in waste sorting and knowledge transfer show that women's empowerment is a key factor in the success and sustainability of waste bank management. These findings confirm that strengthening the role of women contributes to sustainable waste management while supporting the achievement of SDGs 5 and 12.

The Gondangan Sejahtera Waste Bank not only functions as a community-based waste management system, but also as a means of women's empowerment that supports the achievement of SDGs 5 through increasing women's participation, capacity, leadership, and economic independence. In addition, the implementation of waste sorting, reducing, and reusing practices as well as increasing public awareness of responsible consumption shows the contribution of the Gondangan Sejahtera Waste Bank to the achievement of SDGs 12. Thus, waste banks become a model that integrates social, economic, and environmental aspects in realizing sustainable development.

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