

Anyelir Waste Bank Program at Medan City on the Application in Circular Economy Techniques

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ABSTRACT

The circular economy approach has begun to be applied as a model for waste management in Indonesia. This approach is expected to improve environmental quality and increase economic value. The Anyelir Medan waste bank has implemented the application of circular economics in waste management with the concept of saving waste to gold. This study aims to analyze the operational activities of the carnation waste bank in realizing the circular economic model of waste management. The research method is descriptive research with an observational research design. Data is processed using mass balance analysis. Through the Anyelir waste bank, savings can be collected into gold savings under PT Pegadaian Persero. Waste managed at the Anyelir waste bank is 1640.94 kg per month, with an average of 828.42 kg (50.48%) of plastic waste, 704.58 kg of paper (42.94%), and 107.92 metals (6.58%). The results of the mass balance analysis show that the total reduction efficiency is 97.2% of the complete waste that goes into bank waste. As much as 1450.97 kg (88.42%) of the waste was sold to recycling factories, 41 kg (2.5%) was used as recycled crafts, and 103 kg (6.28%) was stored in stock. The rest goes to TPA, as much as 45.95 kg (2.8%). The Anyelir waste bank not only focuses on economic value but also tries to increase awareness of the environment through education to improve the community's social life and strengthen the economic pillars. The circular economy movement carried out by the Anyelir waste bank has produced processed waste into compost, recycled creations, and raw materials for paper and plastic factories.

Keywords: *trash, trash bank, circular economy, gold savings, recycling*

Introduction

Waste management in Indonesia is starting to experience improvement in various aspects. A comprehensive waste management approach from upstream to downstream by following a new paradigm that views waste as a resource with economic value and can be utilized is starting to develop [1]. A waste bank can be a solution in implementing recycling waste management which directly involves the community in efforts to sort waste from home while increasing the economic value of the community [2].

The concept of a waste bank is an appropriate model to be applied in circular economic practices. The circular economy is a design of integrated waste processing results involving the community and stakeholders, which can be carried out independently and participative in communities [3]. In practice, the community actively participates in waste segregation and receives economic benefits from saving in the waste bank. A circular economy is a financial system where the central concept of the product life cycle is to reduce, reuse, and improve materials in production, distribution, and consumption. Circular economic activities can be applied to achieve sustainable financial goals, creating a better quality of life, welfare, and social justice [4][5]. So that in its application, the circular economy concept can be applied to recycling business models such as the waste bank concept.

Medan City is one of Indonesia's big cities where waste banks have started to develop. Medan City produces 4.14% paper waste, 5.43% plastic waste, 3.7% glass waste, and 1.73% metal waste [2][6]. Utilization of the resulting waste components can be maximized through community participation in efforts to sort waste at households and save waste in waste banks. The waste bank will collect segregated waste according to its type for further recycling by third parties or factories. The Sicanang Main Garbage Bank in 2017 was still able to manage 0.52% of Medan city waste, and this figure could still be maximized if the community took part in waste management at the waste bank [7][8].

One of the other active waste banks in the city of Medan is the Carnation Garbage Bank. Through efforts to increase the economic value of the community, the idea of the carnation waste bank is to apply waste savings to be exchanged into gold savings in collaboration with PT Pegadaian Persero. Previous research stated that changes in waste management from project-based to community-based waste management had a positive impact. Communities can maximize local potential, expand the reach of factories with various parties, develop markets to increase sales of processed products, and expand the reach of narrow banks with different attractive

systems [9][10]. This study aims to examine the operational activities of the Anyelir waste bank from functional and technical aspects, analyze the mass balance of waste, and examine the implementation of the circular economy in implementing the Carnation Waste Bank[11]–[14].

Research Methods

The research was conducted at the Carnation Garbage Bank in Medan City. The research method is descriptive research with an observational research design. Primary data was obtained through observation and interviews with waste bank managers in the form of waste data managed by waste banks. Secondary data was obtained from waste bank documentation and scientific literature to support the research results[15][16][17]. The scope of the research covers the operational and technical activities of the Anyelir waste bank, the potential for waste recycling based on the mass balance analysis of waste, and the implementation of a circular economy in the activities of the Anyelir waste bank[18]–[25].

Results and Discussion

Profil Bank Sampah Anyelir

Anyelir waste bank is assisted by PT Pegadaian (Persero) among 85 fostered waste banks in Indonesia. In the city of Medan, there are two waste banks administered by PT Pegadaian Persero, namely the Carnation Waste Bank and the Puspa Waste Bank. The Anyelir Garbage Bank was built since This garbage bank was made on December 27, 2018, with a waste sorting program to save gold. The garbage from the community is collected and sorted in a waste bank, then weighed, and the results are held on behalf of the residents who collect the waste. The flagship program of the Anyelir waste bank is that the community, in the form of cash or gold, can enjoy the results of the waste savings[26].

The Carnation Garbage Bank is located on Jl. Pancasila gg Panjang. Tegal Sari Mandala III, Medan Denai sub-district, Medan City. The vision of establishing a waste bank is "sorting out waste, saving gold; The Mission of the Carnation Garbage Bank includes:

1. Keep the environment clean
2. Reducing the amount of waste generation
3. Utilizing waste into gold savings
4. Changing people's behavior in managing waste properly and environmentally friendly.

The Anyelir Garbage Bank operates every Monday to Friday from 09.00-16.00 WIB. The management of the Anyelir waste bank is seven people consisting of:

Chairman	: Muhammad Iskar
Secretary	: Abdul Rahman
Treasurer	: Erlina Harahap
Public Relations	: Martina
Head of Warehouse	: Zunaidi Sihotang

Currently, the Carnation Waste Bank has 300 customers in Medan Denai District, and the number of active customers is 150. Active is said if the customer regularly deposits waste at the waste bank and already has a savings book. Most of the customers are homemakers in the Medan Denai sub-district.

Carnation Garbage Bank Operational Technical

The operational activity of the Anyelir waste bank is the collection of segregated waste from the community in the form of plastic, paper, glass, and metal waste. Garbage can be delivered directly by the community to the Anyelir Garbage Bank or picked up at the agreed collection point regularly. Trash produced at the Carnation Garbage Bank is weighed and then recorded in the customer savings book and the waste bank operational book by the waste bank manager. Waste bank officers further sort garbage collected so that waste can be sorted more precisely and has a higher selling value. Part of plastic and paper waste is made into recycled crafts for certain activities, such as exhibitions of recycled creations held by regional agencies.

Furthermore, segregated waste is sold to third parties or factories. Customers can enjoy the results of the sale of scrap in the form of cash or gold savings at PT Pegadaian (Persero). The profits received by the Anyelir waste bank are obtained from the difference between the purchase of waste and the sale of garbage to factories. The profits are used for the transportation and operational costs of the Anyelir waste bank. The working process of the Carnation Garbage Bank can be seen in Figure 1.

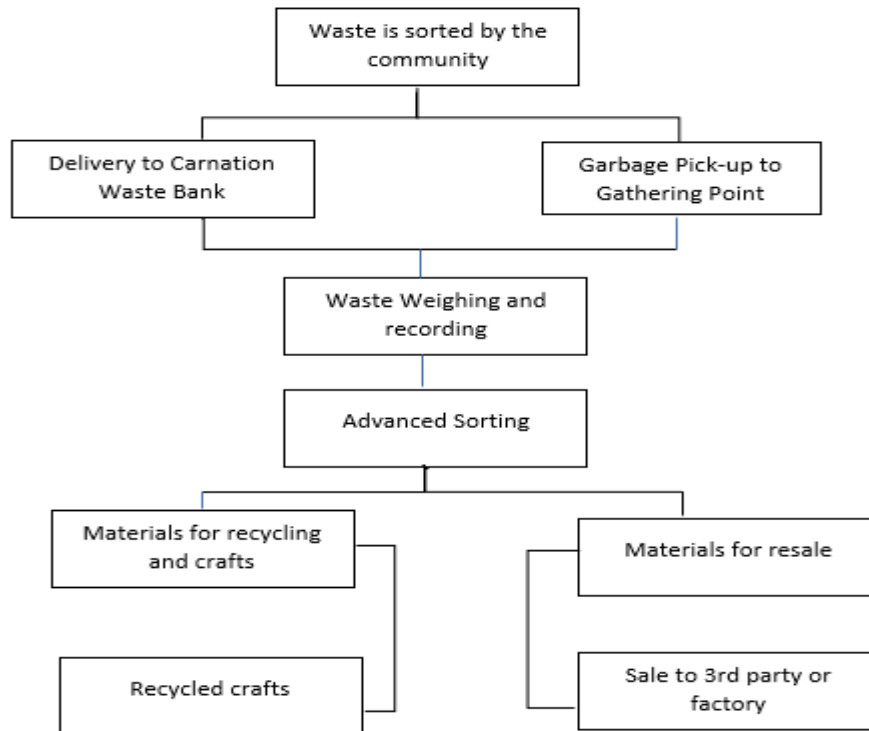


Figure 1. Operational Flow of the Carnation Garbage Bank

The types of waste managed by the Anyelir waste bank are plastic, paper, and metal. The carnation waste bank does not accept glass waste. Besides the meager price of glass waste, it is still rare for recycling factories to accept glass waste. The average amount of waste managed by the Anyelir waste bank is 1640.92 kg per month. The most waste received was plastic waste reaching 828.42 kg/month, followed by paper waste at 704.58 kg/month and metal waste at 107.92 kg/month. The percentage of waste managed by the Anyelir waste bank is dominated by plastic waste, reaching 50.48%. Furthermore, paper waste is 42.94%, and metal waste is 6.58%. For more details, the amount of waste managed by the Anyelir waste bank in the last six months can be seen in table 1.

Table 1. Amount of Waste Managed by the Carnation Waste Bank in 2022

Month	Trash Type (kg)		
	Plastic	Paper	Metal
January	241	797,5	60,5
February	304	875	97
March	1500	836	200
April	400,5	1025	99
May	974	352	67
June	1551	342	124
Total	4970,5	4227,5	647,5
Average per month	828,42	704,58	107,92
%	50,48	42,94	6,58

The plastic waste received by the Anyelir waste bank includes plastic bags, aqua bottles, glasses, colored buckets, gallon lids, gallons, and straightforward. At the same time, the types of paper waste can be cardboard, duplex, HVS, egg nests, and books. Metal waste includes cans, iron, brake treads, cable skins,

engine alma, zinc, and brass. All these waste components have different buying and selling prices, as shown in Table 2.

Table 2. Classification and price of waste at the Carnation Waste Bank in 2022

Trash Type	Klasifikasi Sampah	Harga Beli		Harga Jual	
Plastic	Plastic bags	Rp	1.000	Rp	1.500
	Aqua bottle	Rp	1.500	Rp	1.800
	Aqua Glass	Rp	2.000	Rp	3.000
	Asos	Rp	1.500	Rp	2.000
	Color Bucket	Rp	5.000	Rp	6.000
	Close Gallon	Rp	1.000	Rp	1.500
	Gallon	Rp	2.000	Rp	3.000
	Clear	Rp	6.000	Rp	7.000
	pp screen printing	Rp	1.000	Rp	1.500
Paper	Cardboard	Rp	2.400	Rp	2.800
	duplex	Rp 700		Rp	1.200
	Hvs	Rp	2.000	Rp	2.500
	Egg Nest	Rp 250		Rp	500
	Book	Rp	2.000	Rp	2.300
Metal	Can	Rp	2.000	Rp	2.500
	Iron	Rp	3.000	Rp	5.000
	Brake Tread	Rp	2.000	Rp	3.000
	Cable Skin	Rp	500	Rp	1.000
	Alma Machine	Rp	14.000	Rp	16.000
	Zinc	Rp	3.000	Rp	3.200
	Brass/KN	Rp	5.000	Rp	6.000

Based on figure 2 of the mass balance flow chart, waste management at the Anyelir waste bank can reduce as much as 1640.92 kg of waste per month. The total reduction efficiency is 97.2% of the complete destruction that enters the waste bank. 1450.97 kg (88.42%) of the waste sold to recycling factories, 41 kg (2.5%) of recycled crafts, and 103 kg (6.28%) of stock stored in stock. The remaining 45.95 kg (2.8%) of waste that cannot be utilized is disposed of in the TPA.

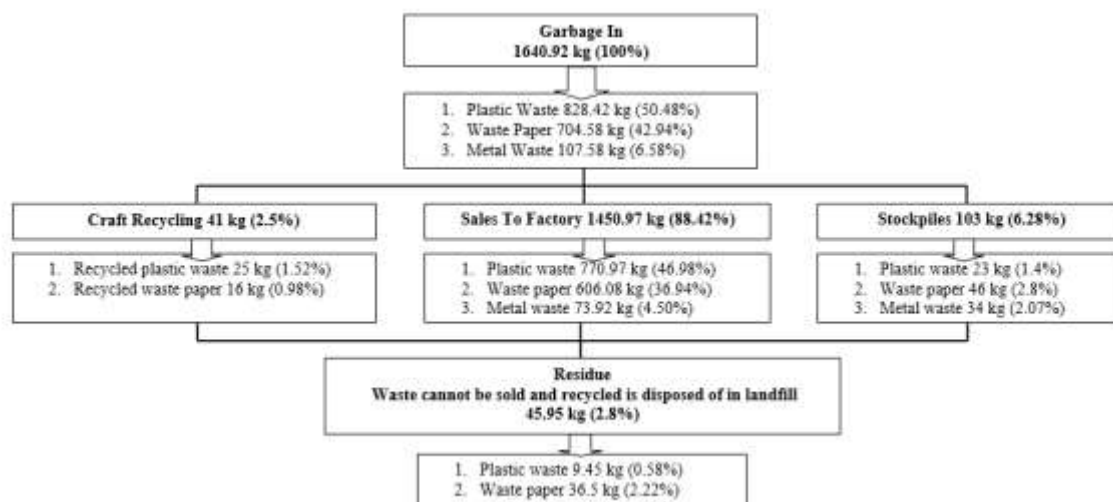


Figure 2. Flow chart of mass balance in waste management at the Carnation Waste Bank

Implementasi Ekonomi Sirkular pada pada Bank Sampah Anyelir

According to the Central Bureau of Statistics for Medan City, the population in Medan Denai District, a source of waste managed by the Anyelir waste bank, is 169,643 people. Medan City has a waste generation of 0.295 kg/person/day. The percentage of paper waste is 4.14%, plastic waste is 5.43%, and metal is 1.73% [5]. Thus it can be estimated that the discharge of waste produced by the people of the Medan Denai sub-district is 1,501,341 kg/month or the equivalent of 1,501 tons/month. Compared to the amount of waste managed by waste banks of 1640.92 kg/month, the percentage of waste absorbed managed by waste banks is only 0.01% of the total waste in the Medan Denai sub-district. This absorption is still deficient if you only focus on 1 unit of the waste bank in each waste bank. Even so, the Anyelir waste bank and the surrounding community must be given proper appreciation and support because they have implemented the state's mandate by the Minister of Environment and Forestry Regulation 14 of 2021 concerning Waste Management in Waste Banks. Garbage bank activities by these regulations mandate that the management of waste banks through waste handling and segregation has been carried out.

Waste management at the Anyelir waste bank is still at the stage of collection and sorting to be sold to recycling plants. There has been no processing action such as enumeration by the carnation waste bank. Sales to factories are carried out periodically if sales targets are met. This is done to maximize transportation costs for one-time transportation in the maximum amount of waste.

Things that need to be evaluated are by Minister of Environment and Forestry Regulation 14 of 2021 concerning Waste Management at Waste Banks, namely

1. Evaluation of the amount and type of waste that is segregated, collected, reused, and processed;
2. Evaluation of the Garbage Bank facility;
3. Evaluation of environmental conditions around the Waste Bank;

The evaluation referred to in the regulation is used as a basis for consideration of the sustainability of the Waste Management Partnership with the Waste Bank. The government should also take part in waste management with waste banks. We are providing incentive assistance to waste bank managers to cover the vast operational costs of waste banks.

Circular economy implementation has been applied in several countries, such as North America and Europe. Circular economy implementation is used to research and apply the principles of reduction, reuse, and recycling in people's daily lives [8]. Waste management can be used as the central concept of a circular economy design through the results of a review of product components and activities to manage these products. Consumers' garbage can be recycled by reducing, reusing, and recycling before being disposed of in a landfill. Based on the results of research on waste management in Germany, it is explained that the circular economy aims to turn waste management into resource management. Germany accommodates large industrial industries to manage the waste produced so that raw materials can utilize the waste produced.

Circular models run like this provide benefits to the environment [9]. Based on this research, the circular economy concept can be related to the activities that take place in the waste bank. The waste bank has a role in collecting waste from consumers, namely the community, to be given to third parties or recycling

factories. The recycling factory processes waste, such as plastic, to turn it into plastic ore which can be used as raw material for the plastic and dacron industries.

The waste bank program is one waste management activity involving the community's active role in waste segregation. Segregated waste that has economic value is saved in a waste bank, and then the results of the savings can be obtained in cash. Communities gain financial benefits from waste-saving activities [2]. In addition to the perceived economic value, indirectly, it can also maintain environmental cleanliness and increase the age of landfill use due to a reduction in the amount of waste that goes to landfill. Government Regulation No. 27 of 2020 concerning Specific Waste Management (E-Waste) regulates waste reduction and handling matters. Reduction efforts include limiting generation, recycling, and reuse. Meanwhile, handling efforts include sorting, collection, transportation, processing, and final processing. The rules implemented by the government linearly support the waste bank program and circular economy. Garbage collected and sold to recycling plants by waste banks is clear evidence of implementing a circular economy that turns waste management into resource management.

The results of observations and interviews at the Anyelir waste bank, it was found that the waste bank manager carried out several activities to attract people's interest in saving at the Anyelir waste bank and support circular economy programs, including:

1. Carry out regular outreach to the public, both customers and non-customers, regarding efforts to separate organic and organic waste. Waste segregation is a significant factor in the success of waste processing from sources.
2. Carrying out activities of recycling waste into crafts and actively participating in exhibition activities conducted by related agencies. The recycled handicrafts are accommodated by the Anyelir waste bank and exhibited. If anything is sold, it will go into savings.
3. Increase public interest in saving at the waste bank with the waste-turns-gold program. Under the guidance of PT Pegadaian (Persero), people's savings are kept at pawn shops, and if there is a sufficient amount, they can be withdrawn in gold.

There are several weaknesses in the implementation of the applied circular economy. The government has not implemented specific rules for the cooperation between the waste bank, the factory, and the community so that the waste bank's selling waste to the recycling plant runs in such a way as to regulate each other's interests. There is no specific policy to control activities, so they run according to circular economy rules. Further research mentions the lack of clarity in the management structure for implementing a circular economy in the community, making people no longer implement waste banks. Applying a circular economy at the community (consumer) level requires commitment from the community as consumers and policymakers. The cycle will run well with seriousness, transparency, and good coordination. Third parties, such as academics, can also be a bridge between the two [3].

Conclusion

The Anyelir Garbage Bank operates from segregation of waste at the source, collection of segregated waste, weighing, and recording in a savings book. The advantage of the Anyelir trash bank savings program is that you can get savings in cash or gold. The amount of waste managed by the Anyelir waste bank is 1640.94 kg per month, with a total reduction efficiency of 97.2% of the complete waste that enters the waste bank. The percentage of waste absorption managed by the waste bank is only 0.01% of the total waste in the Medan Denai sub-district. This low absorption should be a consideration for the government to pay more attention to waste banks that have taken part in municipal waste management. Total reduction efficiency of 97.2% of the complete waste that enters the waste bank. 1450.97 kg (88.42%) of the waste sold to recycling factories, 41 kg (2.5%) of recycled crafts, and 103 kg (6.28%) of stock stored in stock. The remaining 45.95 kg (2.8%) of waste that cannot be utilized is disposed of in the TPA. The management of the Anyelir waste bank, which sells waste to factories so that the waste is used as a resource, has implemented the implementation of a circular economy.

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