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# Changing the Paradigm of a Linear Economy into a Circular Economy in Residential Waste Management

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**Abstract.** The purpose of this study was to find an effective and efficient way of managing urban household waste. The research method uses a case study. The data was taken from digital recording (Youtube) related to the residential waste management collaboration between Waste4Change and Gunas Land at Vida Bekasi. The research findings show that Waste4Change has implemented the circular economy principle in waste management in Vida Bekasi housing. The circular economy model carried out by Waste4Change in residential waste management should be used as a model for waste management in various other urban housing areas in Jakarta and other big cities.

**Keywords:** Linear economy, circular economy, waste management, recycle, reuse.

## 1. Introduction

Waste has become a world problem today. Not only its impact on environmental damage, but the management of the waste is also costly. Its impact on social life is also inevitable. Waste management in urban areas is more complex than in rural areas. Changes in people's lifestyles, rapid urbanization, and the lack of attention from stakeholders have caused urban waste management to become more complex. Waste management stakeholders in urban areas include waste producers, waste management institutions, and people affected by waste management [1].

Forty-eight percent of waste comes from households [2]. Therefore waste management in housing is a serious concern. Changing the paradigm of the 'take-make-dispose model from a linear economy to a circular economy is very important so that household waste does not end up in landfills. Because it can become a landfill burden as well as various environmental and social problems. This paper presents examples of residential waste management cases using the circular economy paradigm that Waste4Change and Gunas Land have implemented at Vida Bekasi.

## 2. Literature Review

### 2.1. Linear Economy Concept

Hartini et al. [3] said that the traditional concept of linear economy is a concept that applies the take-make-dispose model. This model is an obstacle to solve environmental sustainability problems and to



ensure sustainable economic growth, environmental protection, and social welfare. Lobo and Tyryshkin [4] also said that the “take, make, waste” model is a linear economy model.

Kolesnik and Merkulina [5] said that the linear economy model only prioritizes the production of goods without thinking about how the end of the goods produced. Whether the end of the goods produced just become waste and disposed of in landfills which will damage the soil or be burned, which produces emissions to the air, is not the main concern of the linear economy model.

According to Radu et al. [6], a linear economy is a concept that the company's responsibility is to manufacture resources into goods to meet the community's needs without being responsible on the impact of dumping unused production goods into landfills. Linear economy applies the principle of take-make-dispose economy. This linear economy model has become the main factor on the problem of climate change and ecosystem degradation.

## 2.2. *Circular Economy Concept*

The circular economy concept was proposed in the 1960s when the world began to pay attention to global warming [7]. The Ellen MacArthur Foundation was the first to introduce a circular economy [3]. Recycle and reuse, energy and resource recovery are the major principles of circular economy [8].

Lupu et al. [9] define a circular economy as the active involvement of companies to utilize resources rationally and recover waste to be converted into raw materials again. The circular economy can increase economic value while reducing the consumption of natural resources. Eberhardt et al. [10] define the circular economy as an industrial economy. The concept is how to reduce the environmental burden by restoring resources that have had a declined life cycle or regenerate by extending the life cycle of these resources. Huovila et al. [11] defines a circular economy as the potential to change production and consumption patterns and ensure to reduce waste and turn it into raw materials that provide economic benefits.

Iuga [12] said that, unlike the traditional linear economy perspective, a circular economy tries to overcome environmental problems and limited natural resources by reducing energy consumption and raw materials by increasing the use of renewable or recycled resources from production or consumption waste. This circular economy concept seeks to reduce both emissions and waste resources. Eco-design, reuse, repair, and recycling of products and materials are part of this circular economy concept.

Hartini et al. [3] define the circular economy concept as an effort to reduce the use of natural resources through production waste or post-use product waste into raw materials. 6R implementation can be used to a circular economy implementation strategy. This concept is to change the linear economy concept. According to Hartini et al. [3], a circular economy is no longer an option. It is unavoidable if the sustainability of economic prosperity, ecological and social, and the balance between these three things is our concern.

## 2.3. *The Necessary to Change a Linear Economy into a Circular Economy*

According to Lobo and Tyryshkin [4], a linear economy causes instability in the modern world. This is because it tends to over-produce, speeding up the product life cycle. This increases the volume of production and production waste, as well as wasted waste. The excessive increase in production in the linear economic model also causes the excessive use of biological natural resources (water, biomass, gas, and other natural resources) and technical (plastic, glass, and other materials not found in nature), which in turn increase costs. Various studies have proven that with this linear economy model, the production of goods will end up as waste at the stage of final use or consumption. This causes more severe environmental damage. Climate change and global warming are caused and exacerbated by this linear economy model.

Changing the strategy from a linear economy to a circular economy is essential. According to the Ellen MacArthur Foundation at the 2012 World Economic Forum, recycling could bring the world economy at \$1 trillion annually by 2025 and would create 100,000 jobs, save \$500 million in raw materials, prevent the emergence of 100 million tons of waste. That is the reason why moving from a linear economy to a circular economy model [4].

### 3. Materials and Methods

This study uses a qualitative case study. The collaborative project in waste management in Vida Bekasi between Waste4Change and Gunas Land is the case study of this research. Waste4Change is a waste management company whose mission is to reduce waste that ends up in landfills. The company was founded in 2014 by Mohamad Bijaksana Junerosano under the name PT Wasteforchange Alam Indonesia. Then in 2015, the company built a Material Recovery Facility in the VIDA Bumipala housing estate, Bekasi. Waste4Change also started collaborating with RDF technology providers in 2016 to launch the Zero Waste to Landfill program. Then in 2017, in collaboration with the Greeneration Foundation, to hold the Indonesia Circular Economy Forum (ICEF) for the first time.

The data is taken from videos on YouTube. Chenail [13] said that YouTube is a video hosting service or web-based site that allows qualitative researchers to obtain research data. Mejías [14] said that the Internet is “a new field of study” is valuable fieldwork for qualitative research. This study is preliminary research related to waste management that changes the paradigm of the linear economy into the circular economy by Waste4Change.

### 4. Results and Discussion

#### 4.1. Residential Waste Management

The Business Development Manager of Waste4Change, Banyu Putro, explained that the reason behind the concern for managing waste is that the total waste is enormous in Indonesia. Putro explained that the total amount of waste in Indonesia reaches 175,000 tons per day, and 69 percent of this waste ends up in landfill (TPA), and only about 9 percent of waste is separated [2].

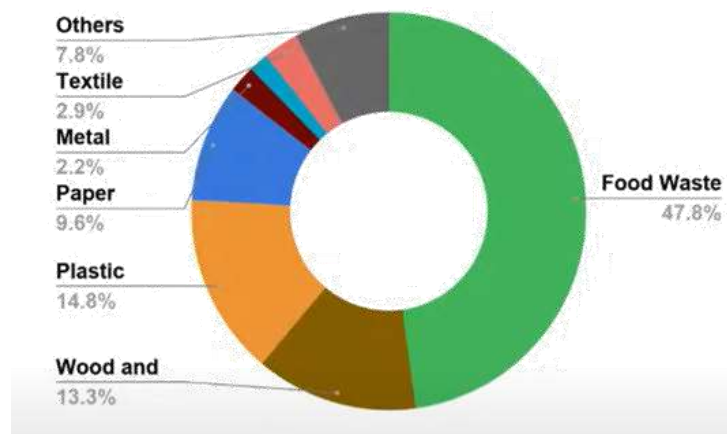
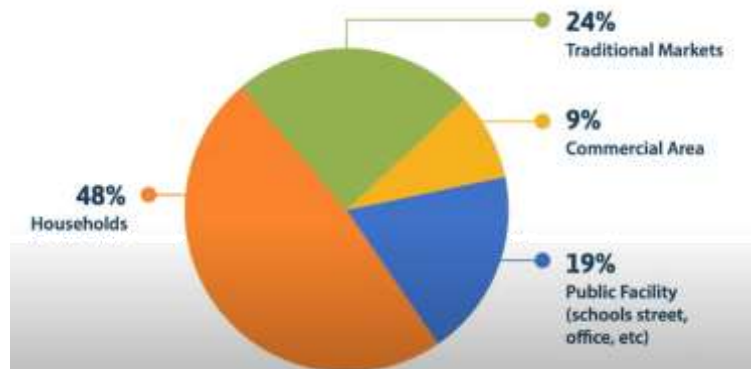


Figure 1. Waste composition [2]

Figure 1 shows that the most significant waste composition is food waste. Then Figure 2 shows that households are the most significant waste origin, at 48 percent, and traditional markets occupy the second position, at 24 percent. Public facilities contribute 19 percent of waste. The commercial area actually only contributed 9 percent [2]. So, households are the most significant waste contributors in Indonesia.



**Figure 2.** Waste origin[2]

Based on the above facts, according to Putro, importance of waste management from upstream to downstream is a must in solving the waste problem. Waste4Change collaborates with housing or developers for the program by providing segregated trash bins in every house, providing education to residents on sorting and disposing of waste into the trash according to its type. For example, organic and non-organic waste bins. Then Waste4Change collects waste from each house three times a week and provides a transport vehicle with containers according to the type of waste to be taken to the Material Recovery Facility (RPM) [2].



**Figure 3.** Material Recovery Facility (RPM)[15]

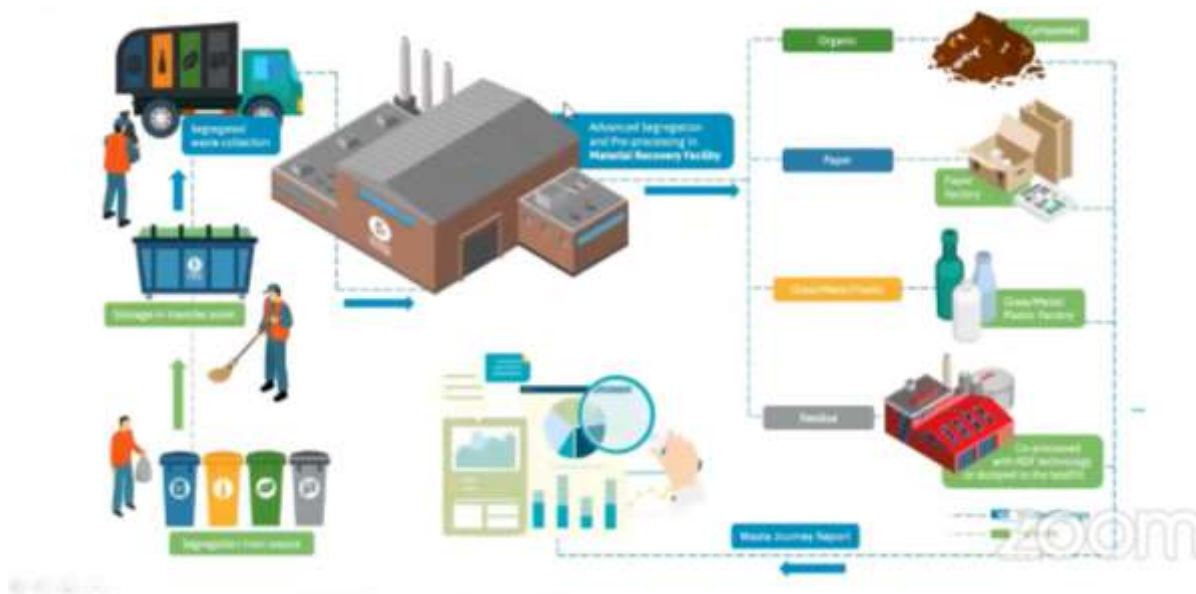
What Putro explained was confirmed by M. Paksi Handoyo, Township Manager of Vida Bekasi, Gunas Land. Gunas Land is a housing developer in Bekasi who is called to solve the waste problem. Handoyo explained that Vida Bekasi is an area with 140 hectares located in the Districts of Mustika Jaya and Bantar Gebang. Since the beginning of this housing development, it has had a mission not to add to the burden of the landfill in Bantar Gebang Bekasi [2].





**Figure 4.** Master Plan Vida Bekasi[2]

According to Handoyo, to find a suitable solution for residential waste management, Vida Bekasi collaborates with Waste4Change to carry out residential waste management. The developer provides trash bins according to their type, which is placed in each resident's house in the Vida Bekasi housing estate. Then three times a week, Waste4Change will pick up and transport the sorted waste to the Material Recovery Facility [2].



**Figure 5.** Waste management flow[2]

#### 4.2. Changing the Paradigm of a Linear Economy into a Circular Economy

Putro explained that changing the paradigm from a linear economy of waste or end of the pipe to a circular economy of waste is a concern of the Waste4Change program. Figure 5 shows Waste4Change waste management flow in residential areas as an implementation of circular economy [2]. Figure 6 shows a linear economy flow, and Figure 5 shows a circular economy flow.



**Figure 6.** Linear Economy[2]

Putro said that Waste4Change makes a waste journey report, and it is shared with residents. Residents know the waste journey and that their waste is managed properly not to cause environmental damage. The residential developer gets the report and can evaluate the performance of the waste management as the solution to the residential waste problems[2].

What Waste4Change has done as described above is truly an example of implementing a circular economy. As Iuga [12] explained that waste-reducing by using materials reducing, product life cycle extending, energy and raw materials reducing, the creation of markets for secondary raw materials, waste separation, and collection systems are prerequisites for achieving a successful circular economy.

The concept of turning a linear economy into a circular economy carried out by Waste4Change above will reduce waste disposal to landfills and create economic benefits. Hartini et al. [3] stated that the change from a linear economy to a circular economy model impacts profits for companies. These companies' benefit includes cost efficiency and competitive advantage increasing. Another advantage is the reduction of negative impacts on the environment and society.

According to Putro and Handoyo, there are still residues from sorting waste at the Material Recovery Facility of Waste4Change. What they did with the residue was co-processed with Refuse-derived fuel (RDF) technology or dumped to the landfill [2]. Abidin et al. [16] once said that not all waste can be managed with the principle of a circular economy and is environmentally friendly. The fact is that there is non-biodegradable and non-recycled waste that is a global problem. However, according to Abidin et al. [16], there is a Non-Biodegradable Waste Management Installation, a technology for Zero Waste Management.

## 5. Conclusion

The collaborative project between Waste4Change and Gunas Land in Vida Bekasi shows that the application of a circular economy in household waste management can be implemented and an example or model for waste management in other housing, especially in urban areas. The impact of implementing a circular economy is not only to generate economic benefits, but at the same time, it can reduce the burden of waste in landfills which has so far caused many environmental and social problems. The Zero Waste to Landfill program launched by Waste4Change can be a solution to this problem.

The circular economy project implemented by Waste4Change supports the Indonesian government's policies regarding waste, specifically referring to Law no. 18 of 2008 concerning Waste Management has provided a good basic framework for managing plastic, namely with an emphasis on reducing waste from the start before the material becomes waste. Presidential Regulation (PP) No.97/2017 also focuses on reducing the amount of waste by 30% from sources and increasing the recycling of waste by 70% which is expected to be achieved by 2025.

The limitations of this study are: (1) this is a preliminary study, (2) the data analyzed is limited to data taken from Youtube. Based on the limitation, the future research will collect field data through in-depth interviews with good parties from Waste4Change, Gunas Land, residents of Vida Bekasi housing.

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