# CHANGES IN WASTE MANAGEMENT BEHAVIOR IN SUPPORTING THE IMPLEMENTATION OF GREEN ECONOMY IN MSMEs

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## Abstract

The green economy is an economic concept that aims to improve welfare and social justice and reduce environmental risks. The purpose of this program is to measure the implementation of the green economy in Cimincrang Village, to control waste at the source, and the application of green technology, with local government partners and PKK (*Pemberdayaan Kesejahteraan Keluarga*/Family Welfare Empowerment) cadres, and the subjects are MSMEs (Micro and Small, and Medium Enterprises). The method used was environmental reevaluation, data obtained through observation, interviews, questionnaire distribution, and secondary data support. Programs carried out include: (1) education and communication, (2) community involvement, (3) incentive programs, and (4) policies and regulations. The results show that the understanding of PKK cadres as guardians of the commitment to behavior change was better than MSMEs. Initial conditions show that MSMEs' understanding of waste management and the green economy is in good condition, and has increased to very good. Indicators that are still needed to be improved include: (1) sorting waste is an easy job, (2) owning *loseda*, (3) bringing bags/tumblers/food boxes when shopping, (4) reminding others to sort waste, (5) green economy can improve the quality of life, (6) reducing single-use plastic packaging, (7) awareness that we borrow the environment from the next generation, (8) community awareness to protect the environment. Changes in the behavior of maggot house managers are supported through facilitation of the oven provision, training implementation, and motivational encouragement, in the form of sustainability measures, so that maggot houses obtain funds for development and improvement.

**Keywords**: *behavior change, maggot house, MSMEs, PKK cadres*

## Introduction

The largest source of waste is food waste at 40.7% and wood and twigs at 13% (Rahmawati et al., 2024). Cimincrang Village is a tourist area in East Bandung with three RWs (*Rukun Warga*), including a Waste-Free Area (Riana & Fajri, 2024). Three of them are in Cimincrang village.

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The application of smart technology in cities is a solution to many urban challenges, such as transportation, waste management, and environmental protection (Laufs et al., 2020), pollution control, sustainable production, and urban sustainability (Plekhanov et al., 2023). Waste management can be adopted as a strategic area of the implementation of the circular city model (Gravagnuolo et al., 2019). Nunes & Silva (2023) state that organic waste supply chain management paves the way for the transition to a low-carbon economy. Many innovations are available and are being refined to bridge the gap between the current rate of

resource recovery and its potential recovery (Qadir et al., 2020).

Bioeconomics has several related concepts, namely bio-based economy, green economy, and circular economy (Kardung et al., 2021). This demands a new global society and economy based on reproductive, biodiversity-based processes that meet the economic and social needs today and in the future (D'Amato & Korhonen, 2021). The green economy is an economic concept that aims to improve welfare and social justice and reduce environmental risks. It is a low-carbon, resource-efficient, and socially inclusive approach to sustainable economic growth (Demissew Beyene & Kotosz, 2020; Mikhno et al., 2021). The green economy is characterized by: (1) reducing emissions, (2) resource efficiency, (3) social inclusion, (4) sustainable agriculture, and (5) economic transformation. Its growth depends on science and technology as well as green innovation (Huang et al., 2020).

Green innovation is an effort to increase the value of products/services and contribute to economic growth, making the green economy (Huang et al., 2020). The transition to a green economy requires a systematic approach at all levels, starting with each individual (Mikhno et al., 2021). The necessary conditions for green growth are the development and diffusion of technology (Mealy & Teytelboym, 2022). The green nudge can also serve as an effective policy instrument in designing future environmental policies (Akbulut-Yuksel & Boulatoff, 2021).

Reducing pollution cannot be achieved simply by improving waste management, but it also requires changing consumption habits and behaviors (González-Fernández et al., 2021). Furthermore, a theoretical approach is needed as the basis for behavior change (Anderson et al., 2021). Behavioral science primarily focuses on the i-frame: the individual, his or her thoughts, and behavior. Public policy, on the other hand, focuses on the s-frame: a system of rules, norms, and institutions (Chater & Loewenstein, 2023). Behavior change is an important component of effective waste management. The incentive to separate waste and knowledge about its management is a variable that positively impacts the entire system (Berenjkar et al., 2021).

Behavior change techniques can be done through instructions on how to perform behaviors, cues, adding objects to the environment, and restructuring the physical environment (Allison et al., 2022), increasing public perception, participation, and acceptance in household waste management (Ferdinan et al., 2021). Knowledge, attitudes, and consequences of behavior play an important role in determining intentions and behaviors towards waste sorting (Pratap et al., 2020). Opportunities for behavioral change related to social aspects and potential environmental awareness need to involve broader sustainability aspects, such as savings and income supplements, as well as climate change challenges or hazards associated with waste (Kymäläinen et al., 2021), and plastic ban and public awareness policies (Kumar et al., 2021).

Chew et al. (2019) stated that biofertilizer raw materials from household waste can be obtained at no cost with a continuous supply. The problem is that waste sorting has not been carried out by many people in the city of Bandung, so a behavior change is needed. There are three important elements in changing behavior, i.e.: (1) readiness to change, (2) resistance to change, and (3) the likelihood of relapse. The method used in this program is environmental reevaluation which is proposed Prochaska & Velicer (1997) quoted by Kok et al. (2016), by Transtheoretical Model of Change, is a process of change that involves, considers, and assesses how problematic behaviors affect the physical and social environment, and consists of five stages, namely: (1) precontemplation, (2)

contemplation, (3) preparation, (4) action, and (5) maintenance.

Behavior changes can also be carried out by the government, namely in the form of gifts, punishments, lectures, and motivation (Tummers, 2019). This policy can be done in the form of sustainability measures, such as reduced amounts of food waste or energy saved by behavioral change should include negative sustainability aspects that allow (Hedin et al., 2019).

The program objective is to change the behavior of MSMEs in waste management and the implementation of the green economy, then the utilization of organic waste for maggot houses in Cimincrang Village, Gedebage District, with local government partners and PKK cadres as guardians of commitment and consistency of behavior change, while the subject is MSMEs.

**Research Methodology**

The approach methods used are: (1) socialization with the topic of waste problems and management, programs, implementers, partners, targets, benchmarking, and green economy, (2) training is conducted for PKK cadres in waste handling, responsible for escorting the Kang Pisman (Bandung City's 3R program), and the maggot hangar, (3) the application of technology, aimed at transferring science and technology for program implementers, maintaining commitment and consistency, (4) mentoring and evaluation, (5) the sustainability of the program, behavior change requires commitment and consistency to prevent recurrence, therefore the Village Head and cadres are expected to always be able to monitor the results of behavior change.

The implementation of the program, starting from preparation, program implementation (introduction, technical guidance, and mentoring), monitoring, and evaluation. The introduction activity stage was held at the Cimincrang Village Hall, with a total of 16 PKK cadres, as well as 21 MSMEs from each RW. RWs that have successfully implemented KBS (Waste-Free Areas) can share management experiences and become an example for other RWs.

Behavior changes were measured through observations and interviews conducted by PKK teams, as well as periodic assessments of cadres, to determine the commitment and consistency of implementation, and to prevent the recurrence of initial habits. The distribution of the questionnaire was carried out through a Google form before and after the program to gather responses from MSMEs regarding waste management and the green economy.

## Results and Discussion

The characteristics of PKK cadres who are partners and respondents of this program in Cimincrang Village are mostly 41-50 years old (50%), with the majority having of Diploma/Bachelor's education (81.25%). The test results showed that the understanding of PKK cadres in Cimincrang Village about waste management, behavior change, and green economy was in very good condition, with an average score of 4.61.

The characteristics of MSME entrepreneurs, who are the majority respondents, include being over 50 years old (42.86%) and having a high school education (42.86%). The test results showed that the understanding of MSMEs in Cimincrang Village about waste management, behavior change, and green economy was in good condition, with an average score of 4.19. Some of the things that still need to be improved include: (1) sorting waste is an easy job, (2) maggot can be processed into fish/livestock feed, (3) owning *loseda*, (4) sorting organic and inorganic waste from the source, (5) bringing your own tumbler/food container to buy drinks/food, (6) reminding others to sort waste, (7) feeling guilty if you don't sort waste, (8) borrowing the environment from children, (9)

playing a role in educating others, and (10) using environmentally friendly packaging.

The level of understanding of waste management, behavior change, and the green economy of PKK cadres who are partners in program activities in Cimincrang Village is better than that of MSME entrepreneurs. Furthermore, partners have a mission to improve indicators that still need to be improved. The mentoring program is focused on indicators that still need to be improved, from June to August 2025, using the environmental reevaluation submitted by Prochaska & Velicer (1997), quoted by Kok et al. (2016), and Tummers (2019), that is, the Transtheoretical Model of Change. Adequate education and maturity support the process of behavior change carried out quickly, by involving committed supervisors who blend with the local community and MSMEs, as well as the existence of the KBS pilot project.

PKK cadres are the guardians of the commitment and consistency of MSMEs in overcoming the waste problem (Figure 1). Furthermore, training, technical guidance, and assistance were provided to change behavior and culture to reduce the use of single-use plastics, and sorting organic waste into garbage cans that were ready to be transported by maggot hangar officers to the village. Partners and MSMEs actively participate in the program to foster the behavior and culture of using environmentally friendly materials and sorting waste, thereby increasing awareness of the implementation of a green economy. The use of maggot houses is also increased so that it is able to generate income to improve facilities and infrastructure, as well as the welfare of managers.

The target of this program is MSMEs in Cimincrang Village that reduce the use of plastic packaging, sort waste, and complete organic waste at the village level, as well as increase awareness to realize a green economy. Monitoring is carried out through surprise inspections to see the consistency of changes in MSME behavior. The success of the program was evaluated periodically for eight months. Problems are handled jointly between implementers, partners, and MSMEs to be used as a guideline so that there is no recurrence of the initial behavior in the future.

After assistance was carried out regarding waste handling, behavior change, and the green economy, there was an increase for PKK members to 4.63, and MSMEs became very good with a score of 4.25. Indicators that still need to be improved include: (1) sorting waste is an easy job, (2) owning *loseda*, (3) bringing bags/tumblers/food boxes when shopping, (4) reminding others to sort waste, (5) green economy can improve the quality of life, (6) reducing single-use plastic packaging, (7) awareness that we borrow the environment from the next generation, (8) community awareness to protect the environment. The next problem is the unavailability of adequate waste disposal facilities in RW 01 to RW 06, and the more expensive price of environmentally friendly packaging, which affects the selling price.

Kang Pisman, *Loseda*, as well as the ban on the use of plastic and styrofoam, were used as the basis for these activities. The city of Bandung needs to apply smart technology to overcome the challenges of waste management and environmental protection, as stated by Laufs et al. (2020), pollution control, sustainable production, and urban sustainability (Plekhanov et al., 2023). Waste management is adopted as a strategic area for the implementation of the circular city model, which manages organic waste towards a green economy through technological innovation (Gravagnuolo et al., 2019; Nunes & Silva, 2023; Qadir et al., 2020). The implementation of the green economy requires it to be carried out (Huang et al., 2020), which demands adequate funding, involving all

parties, market transparency, and technology development with a systematic and individual-starting approach (Akbulut-Yuksel & Boulatoff, 2021; Mealy & Teytelboym, 2022; Mikhno et al., 2021).

Pollution control cannot be achieved by improving waste management alone, but requires changes in consumption habits and behaviors to reduce waste generation at the source (González-Fernández et al., 2021). Theoretical approaches are used for behavior change (Anderson et al., 2021), which focus on the i-frame (individuals, thoughts, and behaviors), as well as public policy with a focus on the s-frame (system of rules, norms, and institutions), as stated by Chater & Loewenstein (2023). Behaviors can contribute to public policy by using skills to develop and implement system-level changes to create value. The incentive to separate waste and knowledge about its management is a variable that positively impacts the entire system (Berenjkar et al., 2021).

Waste management is carried out on two sides, namely the sorting of waste at the source. Inorganic waste can be handed over to waste banks, sold, or donated to those in need, and residues are transported by cleaners at the municipal government level. Organic waste is transported by maggot house officers every Monday, Wednesday, and Friday to be further processed as maggot feed. Sorting is a fundamental thing that must be done so that technology can be applied to provide solutions for further processing. Organic waste raw materials can be obtained at no cost with a continuous supply (Chew et al., 2019). It is used as an opportunity for maggot houses to produce wet and dry maggot as products that can be sold both offline and online to consumers by making a profit.

Efforts to reduce the use of single-use plastic (Kumar et al., 2021), and changes in habits (Anderson et al., 2021; González-Fernández et al., 2021; Kok et al., 2016; Prochaska & Velicer, 1997) carried out for MSME behavior change, including (1) education and communication, for example providing clear instructions and environmental education, in the form of organic and inorganic waste disposal instruction labels, (2) community involvement, namely the local government and PKK cadres in each RW through practice-based learning and dialogue that can foster deeper understanding and commitment to waste management practices, (3) incentive programs to motivate MSMEs to participate in waste sorting and reduction activities, in the form of disbursement of funds from the city government for villages that obtain the KBS predicate, (4) policies and regulations, in the form of the implementation of SOPs (Standard Operating Procedures) that ask buyers to bring their places to eat/drink/shop at the time of transactions.

The application of technology is applied in maggot houses (Figure 2), so that maggots can be cultivated and a revenue can be made. Facilitate a chopper machine to chop organic waste before it is used as maggot feed, then an oven to dry the maggot so that it can be sold in a dry and more durable form. Supporting facilities are also provided in an effort to produce maggots according to market needs. Sales are done offline and online. Human Resources (HR) in the early stages uses what is currently available, namely four people, starting from transportation from each RW, separation, enumeration, washing, drying, packaging, sales, and recording. Maggots that have not been sold so far are further processed into livestock/fish feed that is ready to be sold and generate income, thus ensuring their long-term sustainability. This effort also demands a change in the behavior of maggot house managers, which is carried out in three ways, namely gifts, lectures, and motivation (Tummers, 2019). The program is carried out in the form of

sustainability measures and long-term benefits obtained as a result of behavioral change (Hedin et al., 2019; Kumar et al., 2021; Kymäläinen et al., 2021), namely, Maggot House receives funds for the development and improvement of welfare.


**Figure 1**. Behavior Change Team

**Figure 2.** Inside Maggot's House

## Conclusions

The understanding of PKK cadres as guardians of the commitment to behavior change regarding waste management and the green economy was better than MSMEs. There has been an increase in understanding of both PKK cadres and MSMEs towards waste management and the green economy. Indicators that still need to be improved include: (1) sorting waste is an easy job, (2) owning *loseda*, (3) bringing bags/tumblers/food boxes when shopping, (4) reminding others to sort waste, (5) green economy can improve the quality of life, (6) reducing single-use plastic packaging, (7) awareness that we borrow the environment from the next generation, (8) community awareness to protect the environment.

Behavior change is an important component of waste management and has significant implications across environmental, public health, economic, and social domains. Programs carried out for MSME behavior change include: (1) education and communication, (2) community involvement, (3) incentive programs, and (4) policies and regulations. Changes in the behavior of maggot house managers, which are carried out in three ways, namely facilitation for expansion and oven for drying maggot, training, and motivation, in the form of sustainability measures and long-term benefits, so that maggot houses receive funds for the development and improvement of welfare.

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