

# Evaluation of the Sustainability of Waste Reduction Training for the Community: A Case Study of the Rutela Group as a Partner of Pertamina Patra Niaga Fuel Terminal Tegal

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**Abstract.** Waste remains an unresolved environmental issue in Indonesia that has yet to be resolved. One of the contributing factors is the lack of public awareness regarding waste reduction efforts. Although various initiatives have been undertaken to raise awareness through training and knowledge-sharing activities, the long-term impact of such training programs on waste reduction remains underreported. This study aims to examine the sustainability impact of training activities conducted by the Rutela Group and how these activities contribute to waste reduction efforts in Tegal City. A quantitative method supplemented by qualitative data was employed, with the research conducted in Randugunting Subdistrict, Tegal City. The study identified two forms of training sustainability: (1) the implementation of follow-up training and (2) the continuation of collaboration between training participants and the Rutela Group. The training activities showed considerable potential in encouraging participants to engage in waste reduction practices. Several key factors were identified to support post-training waste reduction activities, including the involvement of senior high school students as participants, the proactive initiation of further collaboration by the training organizers, and the emphasis on short-term economic benefits that could be gained by participants through waste reduction practices after the training.

**Keywords:** *Evaluation, waste reduction training, training sustainability, Rutela Group, CSR Pertamina Patra Niaga FT Tegal.*

## A. INTRODUCTION

Waste remains an unresolved environmental issue in Indonesia. The government has made efforts to address this problem by formulating policies, one of which is Presidential Regulation of the Republic of Indonesia No. 97 of 2017 concerning National Policies and Strategies for the Management of Household Waste and Similar Types of Waste. However, the implementation of these policies faces numerous obstacles. In Tasikmalaya, for instance, challenges include inadequate infrastructure, limited public awareness in waste segregation, and coordination issues among local governments, relevant institutions, and communities (Komarudin *et al.*, 2023). Similar challenges are found in Manado, where low public awareness, limited facilities and infrastructure, and suboptimal law enforcement hinder effective waste management policy implementation (Mokodompis *et al.*, 2019). These two studies from different locations highlight that low public awareness is a key underlying issue impeding successful policy implementation in waste management.

Low public awareness as an obstacle to the successful implementation of waste management policies also occurs in Tegal City. According to Fitriani I dan Nurcahyanto H (2017) the main barriers to implementing waste management performance improvement programs in Tegal City include incomplete facilities and infrastructure at some Integrated Waste Processing Sites (TPST), a limited number of incinerators that do not meet ideal standards, and low public participation in waste management. To enhance public participation, Fitriani I dan Nurcahyanto H (2017) suggest providing regular socialization programs on waste management at the sub-district or village level, targeting sub-district heads, village heads,

youth organization leaders, and PKK (Pemberdayaan Kesejahteraan Keluarga) leaders. These individuals are expected to disseminate information directly to the community. Additionally, the number of waste banks, which is currently insufficient, needs to be increased and made more active.

According to the 2021 Tegal City Waste Management Information System (SIPSN) data, the total waste generated was 73,573.52 tons. Of this amount, 4,107.30 tons (5.58%) were successfully reduced, and 56,173.50 tons (76.35%) were managed. These figures show that the city's waste reduction performance is still below the 2021 target of 24% set by Presidential Regulation No. 97 of 2017. However, the waste management target of 74% was achieved.

In response to this issue, PT Pertamina Patra Niaga Fuel Terminal Tegal (FT Tegal), through the Tanggung Jawab Sosial dan Lingkungan (TJSL) Program, has sought to contribute to addressing the waste problem in Tegal City. Prior to 2020, FT Tegal was located in Slerok Subdistrict, East Tegal District, Tegal City. According to Law No. 40 of 2007 on Limited Liability Companies, companies are obligated to consider the interests of the community and the environment in conducting their operations. Accordingly, FT Tegal has placed attention on supporting surrounding communities, particularly those located near the company's operations.

One of the areas near FT Tegal is Randugunting Subdistrict. According to a social mapping report conducted in 2021 by ICSD, waste management in Randugunting Subdistrict remains conventional, with no segregation or recycling practices. This condition reflects the actual situation described in the 2021 SIPSN waste reduction data for Tegal City, which shows a relatively low performance. Despite this, Randugunting Subdistrict has the potential to improve, supported by village regulations mandating resident participation in waste collection sites (TPS). Additionally, a local community group known as Runtah Tegal Laka-Laka (Rutela) group has been active since 2016.

Runtah Tegal Laka-Laka (Rutela) is a group of artisans who create various recycled products from non-hazardous waste (non-B3). These products are crafted into valuable handicrafts. The group consists of 12 members, each specializing in processing a specific type of waste. Rutela began collaborating with FT Tegal in 2021. The group has conducted numerous training sessions for the community in collaboration with various stakeholders, including the Environmental Agency (DLH) (Times Indonesia, 2021). Through the TJSL Non-B3 Waste Recycling Program, Rutela and FT Tegal have carried out multiple initiatives that have produced several tangible outputs and outcomes.

The reduction of household waste and waste similar to household waste refers to limiting waste generation, recycling, and reusing waste materials. Meanwhile, the handling of such waste includes segregation, collection, transportation, processing, and final disposal (Presidential Regulation of the Republic of Indonesia No. 97 of 2017). Tegal City is required to enhance its waste reduction efforts through strategies such as reducing waste generation, recycling, and reusing waste (reduce, reuse, recycle) by achieving a reduction target of 30% by the year 2025, as mandated by the aforementioned regulation. Based on these definitions, the activities undertaken by the Rutela Group fall under the category of household waste reduction efforts. Rutela has also conducted training programs for the general public in Tegal City to spread awareness about the importance of reducing household waste and teach simple ways to process waste into more useful products that even have commercial value.

Efforts to increase the capacity and awareness of the community in waste reduction have been widely implemented; however, many studies focus only on short-term or immediate outcomes (outputs) of such training activities. For instance, Yuwana *et al.*, (2021), and Ermavitalini *et al.*, (2019) reported that training programs successfully improved participants' knowledge and skills in waste management. Nonetheless, these studies did not assess the longer-term impacts or the sustainability of the training. Another study by Hirsan *et al.*, (2021)

showed that a training program improved participants' understanding of waste management using maggots. However, the training did not significantly encourage participants to become pioneers of waste management efforts, with 13.3% of participants expressing hesitation and 86.6% unwilling to take on a pioneering role.

The limited availability of research regarding the long-term impact of waste reduction campaigns is also common in many developing countries. According to a review paper by Zamri et al. (2020), the impact of activities promoting waste reduction is often underreported, and in several cases, programs are discontinued due to funding constraints.

Based on the background above, the research questions addressed in this article are: (1) What is the sustainability impact of the training conducted by the Rutela Group? and (2) How can these training activities contribute to waste reduction in Tegal City? These questions are explored to assess the sustainability outcomes of the training activities in promoting community-based waste reduction efforts and to understand how such training can drive meaningful behavioral change. The Rutela Group is thus positioned as a valuable case study for learning and replication.

## B. METHOD

This study employs a quantitative research approach supported by qualitative data. The quantitative method involves collecting data on training activities conducted by the Rutela Group through a questionnaire instrument, followed by descriptive statistical analysis and result interpretation. To enrich the data, the study also incorporates qualitative methods, including interviews and FGDs with members of the Rutela Group. In addition, the TJSL FT Tegal program report was also reviewed as the person in charge of the TJSL FT Tegal program. The research specifically focuses on training activities conducted between January and December 2024. All activities carried out in 2024 are analyzed, including those organized by external parties and those initiated independently by the Rutela Group. The analysis centers on training sessions in which Rutela Group members served as speakers or trainers.

## C. RESULTS AND DISCUSSION

### 1. TJSL Program of Pertamina Patra Niaga Fuel Terminal Tegal

In general, FT Tegal has provided support that enables Rutela members to engage in productive activities and conduct training related to waste reduction for the community. The following is the Roadmap of Non-B3 Waste Recycling Program by Rutela, implemented under the TJSL Program of FT Tegal for the years 2021–2025.

**Table 1. Roadmap of the Non-B3 Waste Recycling Program by Rutela-TJSL FT Tegal 2021-2025**

2021	2022	2023	2024	2025
<ul style="list-style-type: none"> <li>➤ Provision of supporting equipment</li> <li>➤ Infrastructure improvement for the secretariat</li> </ul>	<ul style="list-style-type: none"> <li>➤ Provision of equipment for recycling activities</li> <li>➤ Equipment for product photography</li> <li>➤ Product display setup for recycled items</li> <li>➤ Upskilling program</li> </ul>	<ul style="list-style-type: none"> <li>➤ Benchmarking visit to Yogyakarta</li> <li>➤ Knowledge sharing with junior and senior high school students across Tegal City</li> <li>➤ Product packaging training</li> <li>➤ Enhancement</li> </ul>	<ul style="list-style-type: none"> <li>➤ Upskilling in social media management and product marketing websites</li> <li>➤ Knowledge sharing with residents in FT Tegal's Ring 1 area (Munjungagung and Padaharja Villages)</li> </ul>	<ul style="list-style-type: none"> <li>➤ Development of an educational curriculum on non-B3 waste recycling</li> <li>➤ Training on narrative writing for product marketing</li> <li>➤ Provision of marketing and sales media</li> <li>➤ Provision of additional</li> </ul>

		of product displays and production tools	➤ Enhancement of product displays and production tools	production support equipment
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The main activity of the Rutela Group is recycling waste into value-added products. The products they create include wallets, decorative trees, brooches, keychains, structural miniatures, tissue holders, hats, and other handicrafts (Website Rutela, 2025). These recycled crafts have succeeded in reaching international markets (Detik Jateng, 2023). In addition to product creation, the Rutela Group conducts training sessions for the general public. The objective of these trainings is to raise public awareness about responsible waste management and to equip individuals with the skills to recycle waste to reduce the amount of waste generated by their households.

The activities undertaken by Rutela align with the government's goals to increase the achievement of waste reduction targets in Tegal City. Moreover, Rutela Group's training initiatives directly address the challenges identified by Fitriani I dan Nurcahyanto H (2017), who emphasized the importance of community outreach in waste recycling. Their training and outreach efforts are capable of enhancing public awareness and motivating households to adopt similar recycling practices at the domestic level.

## 2. Implementation of Training by the Rutela Group

The Rutela Group conducted 30 training sessions for the general public in 2024. Of these, 29 sessions were organized by external institutions that invited Rutela to serve as trainers, while one session was independently initiated and conducted by Rutela itself. When invited as trainers, the Rutela Group typically deploys at least 2–3 members to deliver waste recycling training. On average, each member participated in approximately 12 training sessions throughout the year.

Of the 30 training sessions held in 2024, 2 sessions (6.67%) were delivered without hands-on practice and consisted solely of verbal instruction related to waste management. The remaining 28 sessions (93.33%) included practical activities. These hands-on sessions typically began with a verbal presentation delivered by Rutela members, followed by guided practice sessions where participants learned to create recycled products collaboratively.

Throughout 2024, the majority of Rutela's knowledge-sharing sessions were delivered to students (88.03%), with senior high school students (or equivalent level) comprising 80.05% of the total training participants. The strong interest from schools in equipping students with waste management skills was largely driven by the implementation of the Implementasi Kurikulum Merdeka (IKM) Projek Penguatan Profil Pelajar Pancasila (P5), which includes climate change as one of the thematic issues to be addressed by students (Detik Edu, 2025).

**Table 2. Number of Training Participants by Participant Group**

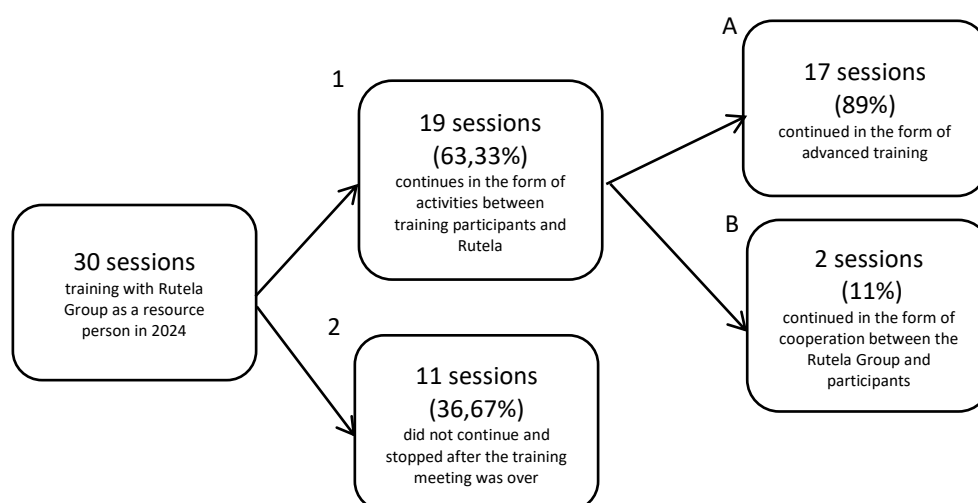
Training Participants		Number of Participants		Number of Training Sessions	
		n (persons)	% (percentage)	(x sessions)	% (percentage)
Students	Kindergarten	90	2.99%	2	6.67%
	Primary School	125	4.16%	2	6.67%
	Junior High School	25	0.83%	1	3.33%
	Senior High School	2408	80.05%	17	56.67%
Adults	Correctional Inmates	45	1.50%	1	3.33%
	Women's Groups	151	5.02%	3	10.00%
	MSME actors	84	2.79%	2	6.67%
	General public	50	1.66%	1	3.33%

Training Participants		Number of Participants		Number of Training Sessions	
		n (persons)	% (percentage)	(x sessions)	% (percentage)
	Teachers	30	1.00%	1	3.33%
TOTAL		3008	100.00%	30	100.00%

Based on Table 2, it is evident that the majority of the training sessions involved students as participants. Senior high school students (or equivalent) constituted the largest group, representing 80.05% of all participants and accounting for 56.67% of the total training sessions conducted in 2024. The second-largest group was women’s groups, comprising 5.02% of total participants and participating in 10% of the training sessions. These women were predominantly members of Pemberdayaan Kesejahteraan Keluarga (PKK) groups. Women, especially mothers, are considered to play a vital role in household waste management, which explains their frequent involvement in waste reduction training activities.

### 3. Sustainability Impact of the Training Activities

Throughout 2024, the Rutela Group conducted training sessions involving diverse participants in terms of age and occupation. Following the implementation of several training sessions, some engagements led to the initiation of new collaborative activities between Rutela and the participants. However, in other instances, the training ended without any continuation of activities beyond the initial sessions.



**Figure 1. Sustainability of Training Activities with Rutela as Resource Persons in 2024**

a. Training Sessions That Continued as Collaborative Activities Between the Rutela Group and Training Participants

Out of the 30 training sessions conducted in 2024, 19 sessions (63.33%) resulted in follow-up activities or new initiatives involving both Rutela and the participants. The majority of these follow-up sessions were conducted with student participants (18 sessions). According to the supervisor of the Rutela Group, many schools organized these training sessions as part of their implementation of the Kurikulum Merdeka (IKM) Projek Penguatan Profil Pelajar Pancasila (P5), which includes climate change as a mandatory theme for student learning (Detik Edu, 2025). The curriculum is a government policy designed to broaden students' understanding of real-world issues encountered in daily life.

In addition to continued training sessions, some engagements led to formal collaboration between Rutela Group and training participants. These partnerships brought mutual benefits to both Rutela Group and the participants involved.

#### 1). Continued Training Through Follow-Up Sessions

A large proportion of the student training sessions did not conclude after a single meeting. Schools frequently organized subsequent sessions targeting different groups of students. Some schools even formalized their collaboration with Rutela Group through a Memorandum of Understanding (MoU). The scope of cooperation in the MoU is that the Rutela Group will provide training to students in several meetings within a certain period.

In 2024, several schools entered into such agreements with the Rutela Group for a series of training sessions. These schools include 1) TK Bias Assalam Kota Tegal, 2) SD IT Usamah Kota Tegal, 3) SMP IT Usamah Kota Tegal, 4) SMA Negeri 4 Kota Tegal, 5) SMA Al Irsyad, 6) SMKN 1 Kota Tegal, and 7) SMKN 3 Kota Tegal. Training sessions were held either in a classroom or in a school hall, depending on the school's request. When the number of student participants was large, practical sessions were conducted in small groups to ensure effective learning. If one group of students had already participated in a session, the next session would target a different group. However, if the same group participated again, Rutela Group would deliver new material in the subsequent session.

Providing training on waste management to students proved effective in increasing their knowledge and skills related to waste handling. Similar findings have been reported in studies by Acmad and Rastika (2024), Elystia et al. (2024), and Zuriatni et al. (2024), which used experimental methods to assess the impact of hands-on waste management training. These studies consistently showed improvements in participants' knowledge, awareness, and skills following the training. Such training was especially effective in fostering positive attitudes toward waste management among students in a short period.

#### 2). Continued Training Through Collaboration Between Rutela Group and Participants

Subsequently, two meetings (11%) continued with collaboration between the Rutela Group and participants. This collaboration demonstrated the participants' increased awareness and skills after the training. This collaboration also benefited both the Rutela Group and the training participants involved.

The first collaboration involved Rutela Group and the Class II B Correctional Facility (Lapas) in Tegal City. This partnership emerged after a training session held in February 2024, which was later formalized through a Memorandum of Understanding (MoU) between Rutela Group and the Class II B Correctional Facility (Lapas) in Tegal City. The material taught to prison inmates during the first training session was how to make various items from old newspapers. The inmates were taught how to roll old newspapers properly. These rolled strips served as the basic material for crafting high-value items such as photo frames.

After the training, inmates regularly make rolls from used newspaper, with the Rutela Group supplying ready-to-roll newspaper to inmates as raw materials. Once completed, Rutela Group representatives collected the rolls and assembled them into finished photo frames ready for sale. This partnership benefitted both parties: the inmates gained access to positive and constructive activities within the facility, while Rutela Group secured a steady supply of pre-processed materials to meet consumer demand. Additionally, Rutela Group compensated the inmates for each completed roll in the form of a service fee.

The second collaboration took place between Rutela and SMK Negeri 1 Kota Tegal. After the initial training session in February 2024, the school expressed a strong interest in establishing a long-term partnership with Rutela Group. In addition to holding follow-up sessions, the school proposed a waste exchange initiative. As an educational institution, SMK Negeri 1 Kota Tegal regularly produces waste such as used newspapers and plastic. The school

agreed to provide this waste to Rutela Group, which would then process it into products requested by the school, such as wall clocks, photo frames, and tissue holders. This waste exchange initiative was conducted approximately 10 times throughout 2024.

In addition, a direct collaboration was established between the Rutela Group and two female students from SMK Negeri 1 Kota Tegal. These two students expressed a strong interest in engaging in waste-based creative production with the Rutela Group. They became actively involved in the group's production activities. In appreciation of their contributions, the Rutela Group provided them with stipends for each product they helped create.

Post-training mentoring constitutes a crucial element that warrants attention. While there has been an observable improvement in community awareness and skills in waste management, as evidenced by the case in Cikini Subdistrict (Basyah & Fajar, 2024), follow-up mentoring is essential to ensure these improvements are sustained. Without continued guidance, the skills acquired may stagnate or be lost over time (Santoso et al., 2021). According to Santoso et al. (2021), developing collaborative networks with external partners capable of providing long-term support, commercial validation, and product marketing is necessary, an approach that has been effectively implemented by the Rutela Group.

#### b. Training Sessions That Did Not Continue

A total of 11 training sessions (36.67%) did not result in follow-up activities and concluded after a single meeting. Most of these non-continuing sessions involved adult participants. Unlike training with school-based participants which is often driven by curricular mandates, the sessions involving adult participants were typically conducted voluntarily.

A study on household food waste identified several reasons why households are reluctant to manage their waste, including feelings of guilt for discarding food, low environmental awareness, financial considerations, and a tendency to avoid responsibility (Nunkoo *et al.*, 2021). Similarly, Strydom (2018), found that barriers such as limited space, lack of time, perceived messiness, insufficient recycling knowledge, and inconvenient recycling facilities contribute to the public's reluctance to engage in waste management. Babazadeh *et al.*, (2018) further highlighted systemic issues such as inefficient waste collection systems, lack of accountability, low awareness, and the expectation of financial incentives as key deterrents.

Despite the Rutela Group's efforts to enhance awareness and skills among adult participants, various other factors contribute to their reluctance to apply the knowledge gained in their daily lives. Achieving behavioral change in waste management practices requires a more comprehensive and sustained effort; training alone is insufficient. Support from multiple stakeholders is vital to accomplish this goal.

#### 4. Rutela Group Training as a Catalyst for Waste Reduction in Tegal City

Throughout its operations, the Rutela Group has made significant contributions to waste reduction in Tegal City. Its members consistently sort their household waste and categorize it accordingly. When needed, the sorted waste is repurposed into marketable products. In addition to using waste generated in their own homes, Rutela Group members also collect waste from neighbors and family members in their communities. Some members have established partnerships with institutions or organizations to obtain waste suitable for upcycling. The group also collaborates with two to three waste banks to procure materials aligned with their production needs.

All waste collected from various sources is then utilized not only to fulfill orders for recycled waste products from consumers. The waste is also used as training materials, conducted by the Rutela Group in 2024. Some of the training sessions also use waste brought by the participants from their own homes. The training sessions required several types of waste

materials for practical learning. In 2024, the types of waste used in training included: old newspapers (30%), plastic shopping bags (28%), plastic bottles (23%), packaging plastic (13%), fabric scraps (5%), and HVS paper (3%). These materials were sourced from multiple channels. Specifically, 14 training sessions (50%) used waste materials collected by Rutela, 3 sessions (11%) used materials brought by participants from their homes, and 11 sessions (39%) utilized a combination of both.

Based on these data, it is evident that the training activities themselves catalyzed promoting waste reduction efforts. Rutela members, having recognized the economic value of waste in their environment, were motivated to collect and repurpose it. Their enthusiasm extended to others in their communities. The knowledge and inspiration shared during training reached 3,008 participants and sparked further waste reduction initiatives, either in collaboration with Rutela or independently. It is also likely that many waste reduction activities have continued beyond the training sessions, even without Rutela's direct involvement.

#### D. CONCLUSION

Based on the findings, it can be concluded that the training activities conducted by the Rutela Group have led to the continuation of post-training initiatives. Two forms of training sustainability were identified: first, the implementation of follow-up training sessions; and second, the establishment of ongoing collaborations between training participants and the Rutela Group.

Training activities hold significant potential in fostering waste reduction behaviors among participants. According to the study, several key factors are necessary to ensure that waste reduction activities occur: First, the targeted participants should ideally be school-aged individuals who are capable of engaging in more complex waste reduction efforts. High school students or those of equivalent age are deemed most appropriate as training participants.

Second, training activities should aim to create opportunities for collaboration between participants and the training organizers or facilitators. For example, organizers may encourage participants to collect household waste and deliver it to the training provider, or to participate directly in the production of waste-based products. Finally, training should not solely focus on raising environmental awareness but should also emphasize the short-term tangible benefits that participants can obtain from waste reduction activities, such as receiving stipends for transforming waste into marketable products.

This study was limited to examining the activities of the Rutela Group in the year 2024. While it is acknowledged that numerous training activities and collaborative efforts took place before and after 2024, these were not within the scope of the present research. The continuity of training assessed in this study is restricted to partnerships formed between training participants and the Rutela Group.

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