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Emissions Reduction in Cities Through Improved Waste Management (Case Study of Community RW 10 Puspanegara Bogor)

By:

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ABSTRACT

This paper examines the emission reduction in cities through improved waste management. The case study conducted in the Community RW 10 Puspanegara Bogor Regency. Problems stated that: Not all people have sorted household waste from the source; Residents still have difficulties in managing household waste due to densely populated areas, the absence of temporary shelters (TPS) for waste before being transported by DLH; Some RWs still use waste management methods that are not climate-friendly, namely by burning. Methodology of this research using Focus Group Discussion (FGD), Social Mapping, Capacity building, Formation of groups, Activity support facilities, Policy and Create a network. The results of the collection were recorded by the PIC in each RT according to the method and reported (in accordance with the Recording Form), Utilize organic waste from households (uncooked organic waste, dry leaves, etc.) for compost, biopori, etc and vegetable waste, rice scraps for animal feed, Recording of non-valuable non-organic waste from households and drop box locations (multilayer, scahet, others). Also education on waste segregation from households for organic, non-organic, residual waste in accordance with the waste reduction flow in RW 10. Furthermore, researchers addressed recommendations, sustainability, communication and lessons learned.

Keywords:
Emission Reduction; Household Waste; Waste Management

Introduction

The environmental aspects of municipal solid waste (MSW) is a main concern in the management of urban services. There are many approaches for the determination of different emissions in different industries and MSW is not exempted from them. Among different methods, life cycle assessment (LCA) of different waste management scenarios in cities is an environmental impact assessment that has been carried out as an action of a comprehensive method in recent years. (Alvarez & Vazquez, 2023) and (Reike & Freitag, 2023)

According to Alves & Quelhas (2023) inadequate disposal of Municipal Solid Waste (MSW) is one of the greatest environmental issues confronted nowadays. Waste-to-energy as a sustainable alternative for municipal solid waste management One of the techniques used for its final disposal is incineration, otherwise known as mass burning. Therefore, their article aimed to carry out a literature review on the evolution of waste-to-energy recovery from Municipal Solid Waste (MSW) worldwide and the progress of mass-burning technologies.

Brunner & Achten (2023) proposed a comparison of different waste management systems for emissions reduction in cities. Solid waste management (SWM) strategies offer huge potentials to contribute to climate change mitigation. To assess the potentials of SWM to

contribute to greenhouse gas (GHG) reduction and resource recovery, available technologies and strategies were analyzed. The role of public awareness and participation in reducing waste through Municipal Solid Waste Management (MSWM) has become a common issue in most developing country along with the rapid urbanization development and globalization. Qualitative approach chosen to analyze literatures selected related to SWM during 2000-2020 (Hauff & Hu, 2023), while Murray & Skene (2023) proposed the use of financial incentives to promote improved waste management and emissions reduction in cities.

Best practices for improving waste management and reducing emissions in cities obtined from discourse surrounding sustainability, particularly in the urban environment, has gained considerable momentum in recent years. The concept of a smart city epitomises the integration of innovative technological solutions with community-centred approaches, thereby laying the groundwork for a sustainable lifestyle. One of the crucial components of this integration is the effective and innovative management of waste. (Ghisellini & Cimpan 2023)

Cunningham & Keirans (2023) proposed the role of government policy while Ragaert & Peeters (2023) proposed the role of private sector in promoting improved waste management and emissions reduction in cities outline specific directions encompassing technological advancement, special waste challenges, digitisation, energy recovery, transportation, community engagement, policy development, security, novel frameworks, economic and environmental impact assessment, and global implications. The insights are vital for policymakers and industry leaders globally, supporting the creation of universal standards and policies, thereby fostering comprehensive waste management systems aligned with global sustainability objectives.

Accoring to Cumbers & Wiles (2023), The social impacts of improved waste management in cities from community participation is required for managing solid waste. Community acceptance and participation in solid waste management are assessed by the presence of a waste bank at the village or neighborhood level. This study aimed to find out the source, economic potency, and handling system of solid waste in a community setting.

Kaza & Lahati (2023) and Zurbrügg & Scherhaufer (2023) provide a comprehensive overview of the economic aspects of improved waste management in cities. It highlights the significant economic benefits of implementing efficient waste management systems, including cost savings, revenue generation, and job creation. The authors emphasize that effective waste management is not only an environmental imperative but also a sound economic investment.

Lieder & Rashid (2023) explores the potential of the circular economy (CE) approach in mitigating greenhouse gas (GHG) emissions from waste management in cities. The authors highlight the CE principles of reduce, reuse, recycle, and rethink as crucial strategies for minimizing waste generation and diverting waste from landfills. They emphasize that implementing CE principles in waste management can significantly contribute to achieving urban sustainability goals. This research in accordance with Purwono & Sulistyani (2023) who studied integrated waste management and emissions reduction in urban areas, a case study of East Jakarta Indonesia. Also and Widyaningrum & Setyawan (2023) who studied effects of improved waste management on emissions reduction in chefs.

This paper examines the emission reduction in cities through improved waste management. The case study conducted in the Community RW 10 Puspanegara Bogor Regency. The Community RW 10 Puspanegara Urban Viilage waste management program is located in Puspanegara village has a population of 1.667 (results of on location identification) people and is a dense settlement, waste will be a major problem, It is expected that with the program from GIZ, the community will be actively involved in reducing waste issues in their environment.

At the moment there is already a Waste Bank in RT 01, 02, 03 & 04 with a total of 190 waste bank customers, 45% of the total number of households in RW 10. Organic waste management with composter that already exists in RW 10 is located in RT 01 with a total of 6 places. Problems underlying the waste problem in RW 10 Puspanegara Urban Village: 1) Not all people have sorted household waste from the source. 2) Residents still have difficulties in managing household waste due to densely populated areas, the absence of temporary shelters (TPS) for waste before being transported by DLH. 3) Some RWs still use waste management methods that are not climate-friendly, by burning.

Project Approach and Context

Table 1. The Approach Taken in The Project in Each Location

No.	RW 10 Puspanegara Urban Villages
1	Waste segregation from households
2	Increase public awareness in climate-friendly waste management changes, starting from households
3	Waste processing into compost, liquid fertilizer, eco enzymes, maggot and RDF, the optimization of waste banks as an implementation of the circular economy.
4	The methodology of this pilot project is in the form of: training, socialization, comparative studies, mentoring, and procurement of goods to support waste reduction activities and the construction of simple physical construction
5	Tthe project location has the opportunity to collaborate in the management of risidu waste into RDF with partners from the Indocement (Cement Company) factory which already has a kiln / technology to accommodate RDF made from household waste.
6	Social Mapping Objectives - As a basis (baseline data) to develop strategies and Society Development programs that are appropriate and targeted - Optimize program management and implementation to stakeholders area - Provide a comprehensive overview of community dynamics in the society development.
7	SWOT analysis
8	At the end of the pilot project, an evaluation can be conducted to obtain the results of target achievement, based on agreed indicators.

Table 1 describes the approach taken in the project in each location in RW 10 Puspanegara Urban Village in RT 01, 02, 03 & 04 with a total of 190 waste bank customers, 45% of the total number of households in RW 10.

Bumi Winaya Lestari Foundation project approach at the project site: 1) Conducted FGDs to equalize perceptions of the project that will run in RW 10 Puspanegara, so that there are agreements, participation and responsibilities of the community, community groups, local policy makers. 2) Conducting Social Mapping with objectives: a) As a basis (baseline data) to develop strategies and Society Development programs that are appropriate and targeted. b) Optimize program management and implementation to stakeholders. c) Provide a comprehensive overview of community dynamics in the society development area.

Table 2 describes the existing baseline data in each location in RW 10 Puspanegara Urban Village in RT 01, 02, 03 & 04 consist of waste bank, composter, land utilization, availability of land and non organic waste collection data in March 2023 by the Waste Bank in RW 10. While Figure 1 shows detail of waste bank collected consist of organic, plastic, paper, metal, textile, rubber, glass and others. Total waste generation potential is 569,5 kg per day.

Table 2. Baseline Data in each RT

No.	DESCRIPTION	01	02	03	04	TOTAL
I	**The Waste Bank**					
	Waste Bank	1	1	1	1	4
	The number of customers	56	22	79	33	190
II	**Composter**					
	The number of communal composter, individuals	6	-	1	-	7
III	**The Land Utilisation**					
	Nursery House	Yes	-	-	-	
	The Limited land for vegetable crops	Yes	-	-	-	
	The Limited land for ornamental plants	Yes	-	-	-	
	Tambulapot	Yes	-	-	-	
IV	**The availability of land**					
	Communal Composter	Yes	No	No	Yes	
	Maggot / BSF (Black Soldier Fly)	Yes	No	No	No	
	The waste bank warehouse	No	No	No	No	

Non-Organic Waste Collection Data in March 2023 by The Waste Bank in RW 10

Non-organic Waste Type	Maret
Plastic	270,0
Paper	422,0
Metal	64,5
Glass	4,0
Total	**760,5**

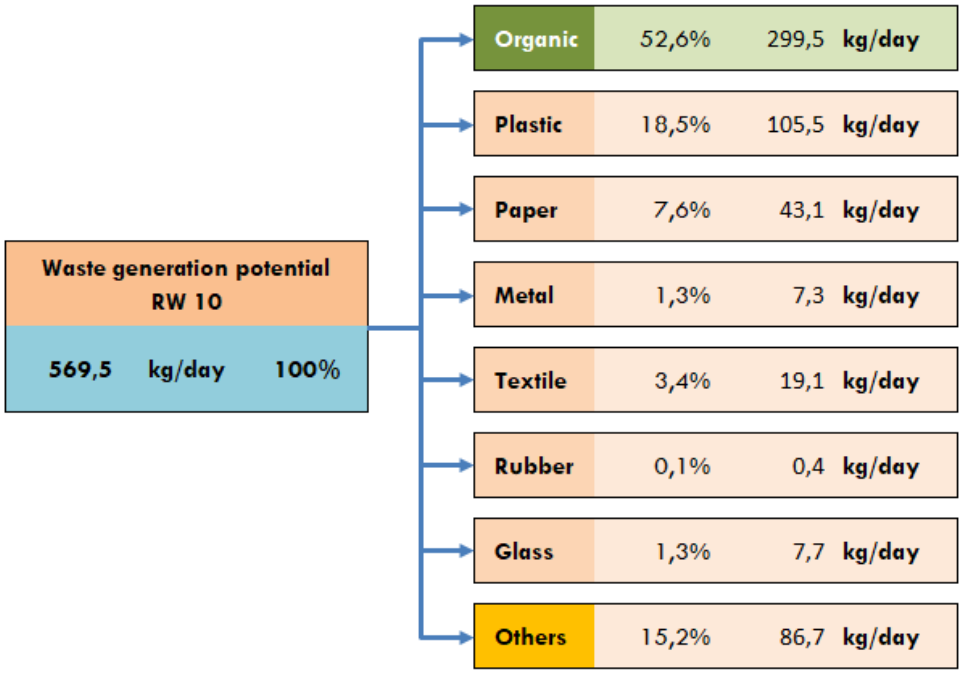


Figure 1. Waste Balance Sheet in RW 10 Puspanegara Urban Village

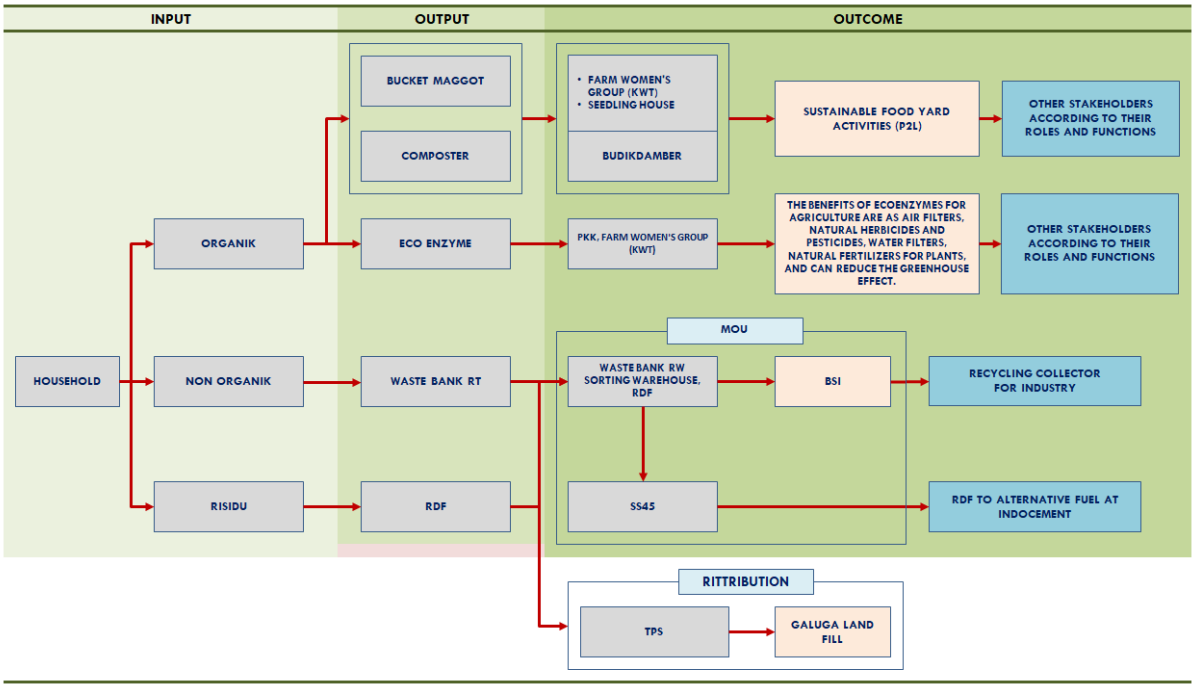


Figure 2. RW 10 Urban Village Waste Reduction Flow

Figure 2 shows the flowchart of input-output-outcome from households to obtain emissions reduction in RW 10 Puspanegara through improved waste management. The flow of waste management in RW 10 pays attention to the circular economy, which is simple and can be easily implemented by the community.

Research Methods

The activities that have been carried out are as follows:

Focus Group Discussion (FGD)

Conduct FGDs with groups, local policy makers and community leaders and have resulted in agreement, support, readiness and cooperation to implement the project. 1) Division of roles and responsibilities, 2) Socialization to the community, 3) Distribution of project supporting facilities, 4) Creation of a central waste bank board.

Social Mapping

Conduct social mapping with groups, local policy makers and community leaders resulting in: 1) Capacity building: a) Education and mentoring to increase the society participation in waste management as a resource, b) Education and assistance to increase the selling value of an-organic waste in the waste banks, c) Education for organic waste management to compost, black soldier fly (BSF), eco enzyme, and residue management to RDF. 2) Formation of groups: a) Establish a rw-scale waste bank, b) Forming farmer women's groups (KWT). 3) Activity support facilities: a) Assist supporting facilities to improve an-organic, organic and residual waste management output, b) The Project support facilities are the responsibility of each RT and must be maintained and used properly. 4) Policy: Create RW and Local policies for sustainability program. 5) Create a network: a) Cooperation in the sale of non-organic waste with waste bank centres (Berdikari) and collectors, b) RDF management cooperation with SS45.

Table 3. Assessment of Progress Towards The Objectives and Output

No.	TRAINING	RESULTS TO BE ACHIEVED
1	Development of waste bank sorting management in RW 10 Puspanegara Urban Village	- Waste bank management understands non-organic waste sorting techniques, to increase the selling value of non-organic waste sorting results. - Waste bank administrators agree to create a central waste bank - Waste bank management optimizes multilayer, non-organic waste that has no value is sorted for RDF raw materials.
2	Centralized waste bank management in RW 10 Puspanegara Urban Village	- Establishment of a central waste bank board - Understanding the functions and duties of the central waste bank board - Managers understand the management of services in the central waste bank - The management understands the management of sorting in the central waste bank. - The management understands the management of pricing in the central waste bank. - Managers understand the management of storage in the central waste bank - The management understands the management of cooperation between the central waste bank and collectors and others.
3	Organic waste management with 2 in 1 Composter in RW 10 Puspanegara Urban Village	- Recipients of the composter facility understand the function of the composter - Recipients of the composter facility understand the types of organic waste that are allowed - Recipients of the composter facility facility understands the process of becoming compost. - The recipient of the composter facility understands how to reduce odor in the composting process. - Recipients of the composter facility understand the benefits and how to use solid and liquid composts - Recipients of the composter facility understand composter maintenance
4	Education on residual waste management into Refuse Derived Fuel (RDF) in RW 10 Puspanegara Urban Village	- Residual waste segregation is carried out starting from households - Residual waste that has been collected in households can be utilized as RDF raw material - Waste pickers sort waste that has the potential to become RDF raw material - There is group cooperation in this case the central waste bank in RW 10 with SS45
5	Organic waste management with maggot bucket in RW 10 Puspanegara Urban Village	- Recipients of maggot bucket facilities understand the function of maggot buckets - Recipients of the maggot bucket facility understand the types of organic waste allowed - The recipient of the maggot bucket facility understands the process of becoming a maggot. - The recipient of the maggot bucket facility understands how to feed maggot to fish in the budidamber.

		- The recipients of the maggot bucket facility understand how to utilize the solid compost left over from the process to be used as planting media, fertilizer for plants on limited land around the house or KWT group - Recipients of maggot bucket facilities understand the maintenance of maggot buckets
6	Fish farming in tanks in RW 10 Puspanegara Urban Village	- Trainees understand the benefits of Budikdamber - The trainees understand how to use Budikdamber - Trainees understand how to maintain Budikdamber - The trainees understand the types of fish that can be raised in buckets - The trainees understand maggot larvae that can be used for fish feed - The trainees understand the types of plants that can be intercropped in Budikdamber. - The trainees understand how to make a Budikdamber, to be developed in their place of residence
7	Standardized unit waste bank governance, and finances in RW 10 Puspanegara Urban Village	- Waste bank management has a standard price (buying and selling) - Waste bank administrators are able to do simple financial bookkeeping - Waste bank administrators can provide financial transparency to customers. - Waste bank administrators can manage waste bank activities well - Waste bank administrators can be responsible for managing waste bank activities.
8	Processing organic waste into eco enzyme in RW 10 Puspanegara Urban Village	- Training participants can use organic waste from fruit, fruit peels and vegetables to process it into liquid which has many benefits for health and the environment - The composition ratio of 1 kg : 3 kg : 10 liters will make it easier to calculate waste reduction - Ecoenzyme will be useful for the RT 04 location which is prone to flooding, it will be useful for use in post-flood handling. - Ecoenzyme will be useful for reducing bad smells in the 2 in 1 Composter
9	Refuse Derived Fuel (RDF) management and opportunities for cooperation with the SS45 UPK manager	- Waste transporters in each RT understand the sorting and types of RDF raw materials that meet the requirements - RDF that meets the requirements will have sales value - Collaboration between RW 10 and UPK SS 45 was realized
10	Management of seed houses, use of solid compost, liquid for limited land crops and finances of women farming groups	- The PKK was able to create a group of women farmers with legal status - Composting activities are integrated with activities - Sustainable Food Yard (P2L) in every RT - The activity of using BSF with maggot buckets helps reduce feed for fish cultivation in buckets

11	Waste bank management network to increase sales value and profits of the central waste bank	- Makes it easy to group types of segregated waste at a good selling price - Opportunities for cooperation between central waste banks in segregated non-organic waste types (PET, Paper, etc.)
12	Creativity and innovation for the development of Waste Bank Units and Central Waste Bank in RW 10	- Waste Bank Units and Parent Waste Banks must be able to make innovations and creativity to educate the community, school children and others, so that sorting behavior becomes a culture or habit. - Bank Sampah Unit gives awards to its customers - Bank Sampah Unit dares to try something new (almsgiving/sedekah waste, exchanging waste for basic needs (sugar, cooking oil and others)

Table 3 describes the assessment of progress towards the objectives of training programs and output results to be achieved consist of 12 training programs and key success indicators. In addition to training activities, supporting facilities have also been handed over to the project in RW 10 to support the project.

Results and Discussion

The results of the collection were recorded by the PIC in each RT according to the method and reported (in accordance with the Recording Form). Utilize organic waste from households (uncooked organic waste, dry leaves, etc.) for compost, biopori, etc and vegetable waste, rice scraps for animal feed

Recording of non-valuable non-organic waste from households and drop box locations (multilayer, scahet, others). Also education on waste segregation from households for organic, non-organic, residual waste in accordance with the waste reduction flow in RW 10.

Table 4. Project Support Facilities and Their Status

No.	Description	Qty	RT 01	RT 02	RT 03	RT 04	BSI	Status
1	Segregated Waste Bin	120	30	30	30	30		In use
2	Trash bag	50	10	10	10	10	10	In use
3	Waste bank signage	1					1	In use
4	Separated Trash Bin (Drop Box)	8	2	2	2	2		In use
5	Tripod scales	1					1	In use
6	Waste hand carts	2			1	1		In use
7	Demonstration plot rack kwt	2					2	In use
8	Manual press machine	1					1	Not In use
9	Work desk	1					1	Not In use
10	Eco Enzymes Making Container	22	6	5	6	5		Not In use
11	Warehouse	1					1	In use
12	Digital scale unit capacity 150 kg	1					1	In use
13	All in one pc	1					1	Not In use
14	Printer	1					1	Not In use
16	Communal Composter Barrels (for 3-5 households)	25	7	6	6	6		In use
17	Composter Barrels (for 1 households)	15	4	4	4	3		In use

Table 4 shows the project support facilities and their usage status in each RT. From 17 facilities, most of them 11 facilities already in used while other 5 facilities still not in use.

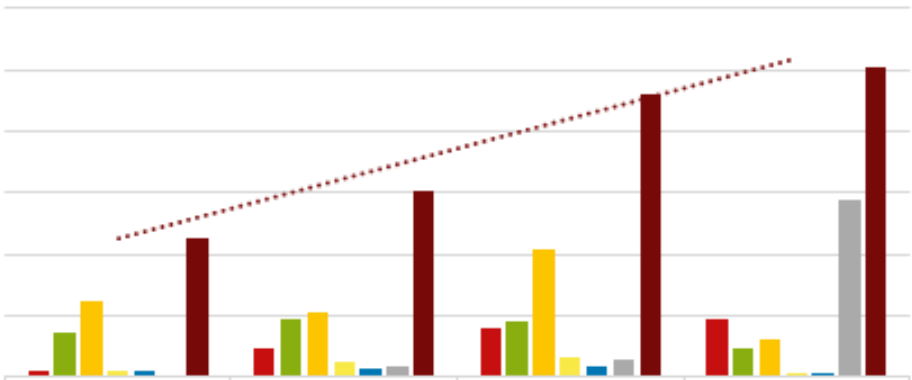
Tabel 5. Outcome, Indicators

Outcome / Specific Objective	Indicators for the outcome
1. Improved collection of usable (LDU) and recyclable waste (BDU) by the Waste Bank, to reduce the volume of waste entering the landfill. 2. Organic waste reduction with BSF, Composter, Eco Enzyme 3. Reduction of residual RDF material waste for cement plant alternative fuels	- Customer growth up to 422 households at Waste Bank RW 10 Puspanegara - The growth of reducing organic and non-organic waste disposed of in landfill increased by up to 2 tons per month in the RW 10 Puspanegara Environment - Procurement and distribution of project facilities
Outputs	**Indicators for the outputs**
1. Increasing management knowledge in managing the Unit Waste Bank in RW 10 Puspanegara and the emergence of a Unit Waste Bank in Sukaresmi village 2. The development of a scheduled separate waste collection system that can facilitate the separation of waste that has been carried out from the source of waste by the community of RW 10 Puspanegara.	- Training Waste Management up to 20 management of Unit Waste Bank in RW 10 Puspanegara area - up to 30 beneficiaries of the Sukaresmi Village Unit Waste Bank - Increasing the capacity of the Waste Bank Unit management up to 15 people in Sukaresmi Village - Tere are up to 120 disaggregated Waste bins in the RW 10 Puspanegara area - The emergence of 1 unit of Waste Bank at the RT/RW level in Sukaresmi Village - BSU Customer Growth up to 50% in every RT in RW 10 Puspanegara - There are disaggregated waste collection workers from the source of up to 4 people in the RW 10 Puspanegara area - The existence of a centralized waste bank warehouse up to 1 unit in the RW 10 Puspanegara area - The increase in economic value of up to 190 customers of the Waste Bank unit is due to the better quality of norganic waste sorting in the Waste Bank. - Improving the quality of administrative standards up to 4 Unit Waste Banks in the RW 10 Puspanegara area. - There is up to 1 Unit Waste Bank in the Sukaresmi Village area - The amount of waste disposed of at TPS/TPS and transported to Galuga LF is reduced in volume - A separate and scheduled waste collection system at RW10 Puspanegara has been developed and implemented.
3. The existence of catfish farming as an effort to food security in limited areas	- There are bucket fish farming facilities in each of up to 20 houses in the RW 10 Puspanegara area - There is an increase in food security up to 20 houses in RW 10 Puspanegara - The amount of waste disposed of at TPS/TPS is reduced in volume
4. Increasing the amount of RDF waste that has been successfully collected by the Unit Waste Bank in RW 10 Puspanegara	- RDF raw supply chain to Indocement through UPKSS45 recorded volume - There is a special RDF waste distribution channel from each BSU to BSI RW 10 Puspanegara as stated in the start - There was a special RDF waste withdrawal transaction by UPKSS45 to the Main Waste Bank RW 10 Puspanegara - There is a reduction in the amount of waste disposed of at the TPS / TPA in the RW 10 Puspanegara area
5. The existence of eco enzyme products in RW 10 Puspanegara	- There are facilities for making eco enzymes to units in the RW 10 Puspanegara area up to 22 unit - Understanding of eco enzymes can be socialized up to 422 households in the RW 10 Puspanegara area - The occurrence of a reduction in waste disposed of at the TPS / TPA in the RW 10 Puspanegara area

6. The existence of Maggot Cultivation is limited to the RW 10 Puspanegara area	- There are bucket maggot facilities up to 40 units in the RW 10 Puspanegara area - There is a reduction in the volume of waste disposed of at the TPS / TPA in the RW 10 Puspanegara area
7. The existence of the Main Waste Bank at the RW level in the RW 10 Puspanegara area	- There is 1 unit of waste bank warehouse in the area of RW 10 Puspanegara - The formation of the management of the Main Waste Bank up to 20 people in the area of RW 10 Puspanegara - The total amount of non-organic waste collected from 4 Unit Waste Banks is recorded - Reducing waste disposed of at TPS/TPS in RW 10 puspanegara area
Activity	**Indicators for the activities**
1. Conducting a waste sorting campaign to the community in the RW 10 Puspanegara area and making whats App media group to disseminate information about the existence of the Waste Bank, Weighing Schedule, Benefits of Waste Bank and the conversion value of disaggregated waste	- Up to 422 households received information about the benefits of waste sorting in RW 10 Puspanegara - Making Whatsapp Group for communication activities in the RW 10 Puspanegara area - Making Instagram for publication activity - The existence of Waste Bank weighing activities at 4 points of RW 10 Puspanegara locations according to a predetermined schedule - The volume of waste collected is recorded according to the number of customers, the amount of waste volume, the amount of rupiah , then archived as a document
2. Placing BUDIDAMBER at the agreed point and maintaining BUDIDAMBER from each KK provided with facilities	- Socialization and education activities on fish farming in buckets to each regional rt in RW 10 Pupspanegara - Budidamber in households in the RW 10 Puspanegara area - Up to 20 houses offer Budidamber benefits - Distribution of catfish fry up to 20 houses with budidamber facilities - Distribution of plant seeds up to 20 houses containing budidamber
3. Waste performance that matches the characteristics of RDF and is collected in one special container	- Waste sorting activities for RDF are carried out up to 4 Waste Bank Units in RW 10 Puspanegra and 1 Bank Waste Unit in Sukaresmi Village - Socialization of the use of RDF (multilayerplastic) waste to up to 422 houses in the RW 10 Puspanegara - There is a record of the volume of RDF Waste that has been collected - RDF Waste deposit/pick-up schedule by BSI RW 10 or UPKSS45 - Activity documentation
4. Carry out Eco enzyme manufacturing activities with method 1,3,10 in accordance with global eco enzyme standards	- Conducting socialization and education activities for up to 422 households in the RW 10 Puspanegara area - There are activities to make environmentally friendly enzymes up to 20 houses in the RW 10 Puspanegara area - Infiltration of organic waste as raw material for making environmentally friendly enzymes recorded in volume - Information on the benefits of environmentally friendly enzymes spread to 422 households through Whatsapp group
5. The placement of maggot buckets at agreed points and the maintenance of each household providing such facilities.	- Placing up to 40 units of maggot buckets in the RW 10 Puspanegara area - Socializing and educating about Maggot up to 4 RT points in the RW 10 Puspanegara area - Routine documentation of maggot
6. Carry out sorting activities at BSI RW 10 Puspanegara entrusted by each RT-level BSU in the RW 10 Pupspanegara area	- Training on sorting waste type in the Main Waste Bank management up to 20 people in the RW 10 Puspanegara area - There is 1 unit of disaggregated waste storage warehouse in RW 10 Puspanegara - Record the volume of Waste according to its type - Create a schedule for the transportation and sale of collected non-organic waste - Arranging the layout of the non-organic waste sorting tank

Tabel 5 describes three actions of outcome, indicators for outcome. The next is description of seven output and indicators of output. And lastly six activities and indicators for the activities.

Results achieved, target groups reached and main activities carried-out is shown in Figure 3 below.



	JUNE	JULY	AUGUST	SEPTEMBER
ORGANIC	46	226	394,9	464,7
PLASTIC	357	468	460,0	227,6
PAPER	620	525	1.046,5	300,1
METAL	43	119	161,8	39,0
GLASS	51	74	90,0	40,5
RDF	15	94	143,1	1.441,5
TOTAL ACTUAL	1.132	1.506	2.296	2.513,4

Figure 3. Total Record Waste Type (kg)

Figure 3 shows data recorded waste bank collected consist of organic, plastic, paper, metal, glass, RDF during four months in June-September 2023. Total waste collected in four months collected with positive trend of increasing collection from 1.132 kg in June to 2.513,4 kg in September 2023. This result shows that the emissions reduction in cities through improved waste management in the case study of Community RW 10 Puspanegara Bogor is proven to be successful.

Table 6. Updated Risk Assessment and Information on Challenges Encountered

Key Risks	Mitigation Strategy
Conflicts between waste bank administrators and customers	- Waste bank unit managers to explain the objectives and mutual agreements from the results of waste bank management. - Waste bank unit managers to be transparent in management, to maintain trust from customers - Make changes to the management structure of the waste bank
Conflict over program facilities provided in each RT in Rw 10	- Make a mutual agreement according to the needs in each RT according to the number of facilities provided - Evaluate the existing facilities in each RT in RW 10 - Facilities that are not utilized will be moved to other RT locations where the community is active in sorting waste.

Table 6 describes the updated risk asessment and informtion on challenges encountered, and mitigation strategy to anticipate the risks.

Beneficiaries and Cooperation Partners

In this project, the foundation and consultant coordinated with the sub-district, village, association, and company about the purpose of the pilot project in RW 10 Puspanegara, and the response was good and ready to support and cooperate. Central waste bank (BSI) under the name Kinanti has been established in RW 10 that functions as an offtaker of the unit waste banks and builds networks between the parent waste bank, collectors, and other stakeholders.

It functions as an offtaker of the unit waste bank and builds a network between the parent waste bank, collectors, and other stakeholders. Coordinating with the head of RT 04 to collaborate with the SS45 manager in waste reduction, to reduce waste burning at TPS RT 04 by sorting residual waste to become RDF raw material

Table 7 below indicates the beneficiaries and cooperation partners consist of name of organizations, relationship involved with organization and progress status of cooperation as per November 2023.

Table 7. Beneficiaries and Cooperation Partners

No.	Name of Organization	Relationship With Organisations Involved	Status as per Nov 2023
1	Head of RT, RW in the Project Location	Support in local policy, community participation	Done
2	Puspanegara Urban Village, Citeureup Sub-district	Support in group legality, environmental programs in Bogor district (KRL, Ecovillage, Proklim, others)	Ongoing
3	Indonesian Waste Bank Association (ASOBSI) of Bogor Regency	Partnership in waste bank development	Ongoing
5	TPS3R SS 45 Citeureup Village	Business of purchasing RDF raw materials, which have been collected by Kinanti Central Waste Bank	Done
6	Berdikari Central Waste Bank	Purchasing business of Kinanti Central Waste Bank's waste products, and introducing potential partners for the sale of Kinanti Central Waste Bank's waste products	Ongoing
7	CSR PT Indocement	Partnership after project completion	Ongoing
8	University – IPWIJA	Jurnal Partnership in the creation of the Kinanti Central Waste Bank report application	Ongoing

Sustainability, Communication and Lessons Learned

Activities in communication and awareness raising, dissemination of lessons learnt and results: 1) With the instagram @bwl_project which has been followed by 79 of various types of environmental actors / activists such as waste bank communities, environmental activists both locally, bogor district, provincial and national, NGOs. 2) In the journey and stages of the project in reducing waste, the project stage process can be followed and understood and can be replicated in other locations. 3) Plan to collaborate with local media to disseminate project activities, so that they can be replicated in other locations in the sub-district, Bogor district.

Activities in regard to cross-cutting issues, gender equality and vulnerable groups: In this project, the involvement of women and vulnerable groups is a concern. For example, involving women in management who also have an important role in decision-making.

Ensuring the long-term effectiveness of the measures: 1) The project approach for potential expansion to other areas is to educate people that waste reduction must start from the source in a simple way according to local conditions. 2) For example, reducing organic waste

can be reduced by using it as animal feed if you have livestock, making communal pits for leaves, grass, and other waste if there is land that can be used. 3) Sorting non-organic waste that has a selling value to be saved in the waste bank, as waste donations, and others

Support from local policy makers and community participation play an important role in the process of accelerating waste reduction from households, and will have the opposite effect if there is no support from local policy makers. Identify potential partnerships at local, district, and beyond levels according to their roles and responsibilities for the development of community-based environmental management activities. Project sites are included in community-based environmental management programs at the district, provincial and national levels.

Contribution to Further Selected Indicators

In selected project locations, stairs will receive advice on processing organic waste such as 2in1 composters, maggot buckets, ecoenzyme drums, With benefits: 1) The results of solid and liquid compost for planting media, fertilizer, in limited land use (P2L) to support the activities of the Women's Farming Group (KWT), PKK. 2) Mangot Buckets are integrated with catfish cultivation with buckets. 3) Ecoenzyme has many benefits for the environment and health

For non-organic waste that has value by increasing the function of the unit waste bank in each RT, and Create a main waste bank on a RW scale. The project also calculated the emission reduction potential during the project, by calculating the amount of waste that can be reduced / not disposed of to landfill.

Conclusion

Conclusion to answer the problems underlying the waste problem in RW 10 Puspanegara Urban Village: 1) Not all people have sorted household waste from the source. Now has been changed by the development of a scheduled separate waste collection system that can facilitate the separation of waste that has been carried out from the source of waste by the community of RW 10 Puspanegara. Improved collection of usable (LDU) and recyclable waste (BDU) by the Waste Bank, to reduce the volume of waste entering the landfill. 2) Residents still have difficulties in managing household waste due to densely populated areas, now has been solved by increasing the amount of RDF waste that has been successfully collected by the Unit Waste Bank in RW 10 Puspanegara. And also the existence of the Main Waste Bank at the RW level in the RW 10 Puspanegara area. 3) Some RWs still use waste management methods that are not climate-friendly, now has been changed by ncreasing management knowledge in managing the Unit Waste Bank in RW 10 Puspanegara and the emergence of a Unit Waste Bank in Sukaresmi village. Organic waste reduction with BSF, Composter, Eco Enzyme, Reduction of residual RDF material waste for cement plant alternative fuels

Recommendations that may be of interest for future implementation of the topic or upscaling of the approach. In every project, it is important to: 1) Identify strategic partners within the project site, and partners outside the project site for the sustainability and development of the project and the partnership model. 2) Social Mapping for: a) As a basis (baseline data) to develop appropriate and targeted Community Development strategies and programs. b) Optimize program management and implementation to stakeholders. c) Provide a comprehensive picture of community dynamics in the community development area

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