Plastic Waste Reduction Standard

PLASTIC WASTE RECYCLING & IMPROVING WASTE PICKER LIVELIHOODS IN KENYA

Document Prepared by South Pole Carbon Asset Management Ltd.

Project Title	Plastic Waste Recycling & Improving Waste Picker Livelihoods in Kenya
Project ID	-
Version	01.1
Date of Issue	21/11/2022
Project Location	Kenya
Monitoring Period	01/01/2022 to 31/08/2022
Prepared By	South Pole Carbon Asset Management Ltd
Contact	Rohit Garg Regional Head Carbon Project Development South Pole Carbon Asset Management Ltd Technoparkstrasse 1 8005 Zurich, Switzerland registration@southpole.com; +41-435013550,
VVB Contact	Carbon Check (India) Private Ltd, Contact e-mail: info@carboncheck.co.in

CONTENTS

CONTENTS **2**

1 PROJECT DETAILS **4**

1.1 Summary Description of the Project 4
1.2 Project Type and Eligibility (2.1) 5
1.3 Project Configuration (3.3) 6
1.4 Project Proponent 8
1.5 Other Entities Involved in the Project 9
1.6 Ownership (3.4) 9
1.7 Project Start Date (3.5) 9
1.8 Project Crediting Period (3.6) 9
1.9 Estimated Collected and/or Recycled Plastic Waste 10
1.10 Description of the Project Activity 10
1.11 Project Location (3.7) 17
1.12 Conditions Prior to Project Initiation 18
1.13 Compliance with Laws, Statutes and Other Regulatory Frameworks (3.1.3) 20
1.14 Additional Information Relevant to the Project 22

2 STAKEHOLDER ENGAGEMENT AND SAFEGUARDS **23**

2.1 Stakeholder Engagement (3.13) 23
2.2 Public Comments (3.13.15 – 3.13.18) 26
2.3 Safeguards (3.14) 26
2.3.5 Additional Impact Certifications (3.14.16) 29

3 APPLICATION OF METHODOLOGY **29**

3.1 Title and Reference of Methodology (3.1.2) 29
3.2 Applicability of Methodology 29
3.3 Project Boundary (3.8) 32
3.4 Project Region 35
3.5 Plastic Waste Collection and/or Recycling Baseline Scenario (3.9) 35
3.6 Additionality (3.10) 38
3.7 Methodology Deviations (3.15) 41

4 ESTIMATED COLLECTED AND/OR RECYCLED PLASTIC WASTE **41**

4.1 Baseline Collected and/or Recycled Plastic Waste 41
4.2 Project Collected and/or Recycled Plastic Waste 42
4.3 Net Collected and/or Recycled Plastic Waste 43

5 MONITORING 46
5.1 Data and Parameters Available at Validation (3.12) 46
5.2 Data and Parameters Monitored (3.12) 47
5.3 Monitoring Plan (3.12.3 – 3.12.5) 51

6 IMPLEMENTATION STATUS 52
6.1 Implementation Status of the Project Activity 52

7 QUANTIFICATION OF COLLECTED AND/OR RECYCLED PLASTIC WASTE 53
7.1 Data and Parameters Monitored 53
7.2 Monitoring Results 56
7.3 Baseline Collected and/or Recycled Plastic Waste 57
7.4 Project Collected and/or Recycled Plastic Waste 58
7.5 Net Collected and/or Recycled Plastic Waste 59

8 APPENDICES 61
8.1 Appendix 1: Attached are pictures for the proof of project ownership – Lease agreement (sample) 61
8.2 Appendix 2: Attached are pictures for the proof of collection activity 61
8.3 Appendix 3: Attached are pictures for the proof of recycling activity 62
8.4 Appendix 4: Attached are pictures for proof of sale of recycled material (Flakes and Pellets) 62

1 PROJECT DETAILS

1.1 Summary Description of the Project

The "Plastic Waste Recycling & Improving Waste Picker Livelihoods in Kenya" project is a grouped plastic waste reduction activity developed and coordinated by TakaTaka Solutions[1] Ltd (TTS). This project (hereafter referred to as TTS Plastic Waste Recycling Program, or the TTS PWRP) aims to recover and recycle additional plastic waste throughout the host country of Kenya.

Baseline scenario. Current waste disposal methods are extremely harmful to human and environmental health: 92% of plastic waste produced in the Kenya region is mismanaged[2] and less than 10% of overall waste is recycled. In the case of Kenya, around 56%[3] of the total amount of plastic waste is openly burnt, leading to air pollution problem. The plastics now targeted under TTS PWRP could not be managed as there were no recyclers or alternative waste technologies able to manage the plastic types. Hence, these materials were taken to the dumpsite for disposal. Full detailed overview of baseline scenario is mentioned under section 3.5.

TTS PWRP collection and recycling operations: TakaTaka Solutions runs end-to-end plastic collection and recycling operations in Kenya (see Figure 2 in section 1.10.2 for the process flow). The TTS PWRP activities begin at the collection stage. TTS sources (see section 1.10.1 for sources of collection) the plastic types and once the specified plastic waste is collected (and sorted if necessary), it is transported to TTS recycling facilities. TTS has both a rigid and a flexible plastic washing line, along with pelletizing capabilities. The TTS plastic recycling process (see Figure 3 in section 1.10.2) is a mechanical one, first shredding and grinding incoming plastic for easier processing. The product is washed and dried to remove the impurities before being transformed into higher value plastic pellets in one of the three in-house plastic pelletizers. Plastic pellets are then sold to local manufacturers.

TTS PWRP Instances and its locations: Instance 1: It includes one rigid plastic washing line, one flexible plastic washing line, and three pelletizer units at the Ehothia site, along with five buyback centers (one in Mombasa and four in Nairobi – Thika, Kitengeala, Dandora, and Mlolongo). **Instance 2:** TTS plans on commissioning a new flexible washing line (at the same site as the existing recycling plant) and four more buyback centers across Kenya (Nakuru, Kakuma, Kisumu, and Mombasa).

The credit financing would allow the TTS PWRP to substantially address the abundance of plastic waste as much as possible from the natural ecosystem within the host country; acutely reduce the use of virgin plastic by manufacturing companies by providing plastic pellets at an affordable price; and help in income-generating via sustainable jobs in the field of plastic waste recovery and recycling. This will take place both in the formal sector (TTS employees) and the informal sector (waste pickers).

[1] https://takatakasolutions.com/
[2] https://plastichotspotting.lifecycleinitiative.org/wp-content/uploads/2020/12/kenya_final_report_2020.pdf, page 5.
[3] https://plastichotspotting.lifecycleinitiative.org/wp-content/uploads/2020/12/kenya_final_report_2020.pdf, page 24.

Estimates for the annual average and the total amount of recovered and recycled plastic waste as follows:

Instance 1: It is estimated that an annual average of 7,094 tonnes of plastic waste would be recovered from the environment, and around 4,434 tonnes of plastic would be recycled. The aggregated quantities of plastic waste recovered and recycled during the crediting period are 49,660 tonnes and 31,037 tonnes, respectively.

Instance 2: It is estimated that an annual average of 7,829 tonnes of plastic waste would be recovered from the environment, and around 4,893 tonnes of plastic would be recycled. The aggregated quantities of plastic waste recovered and recycled during the crediting period are 39,145 tonnes and 24,465 tonnes, respectively.

1.2 Project Type and Eligibility (2.1)

TTS PWRP is eligible under the scope of the plastic program due to the following:

a) Plastic waste type(s) managed by the project:

The project manages the following types of plastic waste, which are all eligible for the plastic program, including but not limited to:

- PET
- PP
- PS or EPS
- HDPE
- LDPE

	Production process	Plastic type	TTS internal terminology	Example	Common products	
Rigid	Injection molded	PS	PS injection		• Clear plastic utensils, petri dishes	☐
	Extrusion	PS	PS extruded		• Insulation board	☐
	Thermoformed	PP	PP thermoformed		• Plastic cups, containers	✓
		PET	PET thermoformed		• Plastic food containers	✓
		PS	PS thermoformed		• Styrofoam food container	☐
Flexible	Blow molded	LDPE	LDPE flexibles		• Trash bags, candy wrappers	✓
		PP	PP flexibles		• Bread bags	✓
		HDPE	HDPE flexibles		• Grocery bags, cereal bags	✓
		PET	PET flexibles		• Plastic films	✓
		PS	PS labels		• Labels	☐
		Mixed	Multilaminates		• Any product that has layers of different plastics, such as sealed food bags	☐
	Woven	PP	PP woven		• Rice, flour, and maize sacks	✓
	Non-woven	PP	PP non-woven		• Reusable grocery bags	✓

Figure 1: The plastic types which are managed by TTS PWRP

a.) The project is a collection and/or recycling project:

TTS PWRP is a grouped project activity involving collection and recycling of plastic waste. The collection activity includes informal and formal collection channels.

b) Activity type(s) in the project:

Collection, sorting, and mechanical recycling of plastic waste material types eligible under the VERRA Plastic Program.

c) Demonstration that the project has not generated plastic waste primarily for the purpose of its subsequent collection and/or recycling:

The project collection source is mentioned in Section 1.1 above. In addition, it is explained in the same section that the host country has a baseline scenario of unmanaged plastic waste. The plastic pollution problem is very acute, with current infrastructure capacities of local government bodies unable to manage the plastic waste. Thus, it is evident that the project does not generate plastic waste primarily for subsequent collection and/or recycling.

1.3 Project Configuration (3.3)

The project is a grouped project activity as described in the Plastic Waste Reduction Standard v1.0. The main objective is to promote the plastic waste management practices while creating jobs and income for the waste pickers to develop a sustainable solution for the community and the environment.

1.3.1 Eligibility Criteria (grouped projects only) (3.3.13)

The project is a grouped project with the following eligibility criteria for inclusion of new project activity instances into the grouped project activity:

1) Applicability conditions: The project activity instances shall meet applicability conditions set out in the applicable methodologies PWRM0001 & PWRM0002 version 1.1 and their future updates as defined in Section 3.2.

2) Geographical area: The project activity instances to be included in the grouped project activity will be the activities involving plastic waste collection and mechanical recycling technology measures located within the host country, Kenya.

3) Baseline scenario: All project activity instances shall meet the baseline definition as defined in respective methodology and as explained in Section 3.5.

4) Technology type: The project activity instances to be included in the grouped project activity will be activities involving plastic waste collection and mechanical recycling technology measures within the host country.

5) Additionality: The project activity instances to be added as part of the grouped project will meet additionality criteria as set out in the methodology.

6) Start date: The start date of each project activity instance under the grouped project should not be prior to the start date of the grouped project. The start date of each project activity instance will be determined through documentary evidence.

7) The Grouped Project must meet specific requirements as stipulated by the Entity responsible for coordinating and managing grouped projects, and for conducting local stakeholder consultations and environmental impact assessment (EIA), as applicable.

   Evidence of project ownership, with respect to each project activity instance: This will held by the project proponent from the respective start date of each project activity instance (i.e., the date upon which the project activity instance began collecting and/or recycling plastic waste).

The following table demonstrates how the initial project activity instances included in the grouped project activity fulfill the abovementioned eligibility conditions:

Table 1: Project eligibility criteria and its justification.

S.No	Eligibility Criteria	Justification (Y/N)
1	Applicability conditions: The project activity instances shall meet applicability conditions set out in the applicable methodologies PWRM0001 & PWRM0002 version 1.1 and its future updates.	Instances 1 & 2 meet the applicability conditions of methodologies PWRM0001 & PWRM0002 version 1.1, fulfilling this eligibility criterion. Please refer to Section 3.2 of this document for methodology applicability criteria.
2	Geographical area: The project activity instances to be included in the grouped project activity will be the activities involving plastic waste collection and mechanical recycling technology measures located within the host country, Kenya	Instances 1 & 2 meet the applicability conditions as both the instances are located within the host country, Kenya. Hence, this eligibility criterion is fulfilled.
3	Baseline scenario: All project activity instances shall meet the baseline definition as defined in respective methodology.	Both the initial project activity instances have the same baseline as per the methodologies requirements as detailed in subsequent sections. Hence, this eligibility criterion is fulfilled. Please refer Section 3.5 of this document for the baseline scenario.
4	Technology type: The project activity instances to be included in the grouped project activity will be activities involving plastic waste collection and mechanical recycling technology measures within the host country.	Both the initial project activity instances have the same technology type, i.e., they involve plastic waste collection and mechanical recycling technology within the host country. Hence, this eligibility criterion is fulfilled.

5	Additionality: The project activity instances to be added as part of the grouped project will meet additionality criteria as set out in the methodology.	The additionality for both instances is included in line with the respective methodologies, as demonstrated in Section 3.6 of this JPD. Instances 1 & 2 are automatically additional as the penetration rate of the collection and recycling activity is below 20% in the host country, Kenya. Furthermore, Step 3b (Investment analysis) has also been carried out to understand the project viability and it is found that the Equity IRR (Internal Rate of Returns) (financial indicator) is significantly below the benchmark.
6	Start date: The start date of each project activity instance under the grouped project should not be prior to the start date of the grouped project. The start date of each project activity instance will be determined through documentary evidence.	The start date of the grouped project is considered as the earliest operation date of Pelletizer 1 (i.e., 01/01/2022) of the project activity instance and the start date of all other project activity instances after this date.
7	The Grouped Project specific requirements stipulated by the Entity responsible for coordinating and managing grouped projects, and for conducting local stakeholder consultations and government approval/licenses for operating the plastic waste recycling facilities and/or EIA, as applicable	Local stakeholder consultation has been conducted as a part of the grouped project activity. National Environmental Management Authority (NEMA) licenses are well received. EIA shall be carried as per host country regulations for the grouped project. Hence, this condition is fulfilled.
8	Evidence of project ownership, with respect to each project activity instance: This will be held by the project proponent from the respective start date of each project activity instance (i.e., the date upon which the project activity instance began collecting and/or recycling plastic waste).	Taka Taka Solutions is the owner for both the instances. Project proponents demonstrate that they have the legal right to control and operate project activities. Ownership documents in line with the Section 3.4.1 of the Plastic Waste Reduction Standard V1.0 shall be submitted later during validation of the activity.

1.4 Project Proponent

Organization name	TakaTaka Solution Ltd
Contact person	Daniel Luis Paffenholz
Title	CEO

Address	Laikipia Townhouses No1&2, Laikipia Road Kileleshwa, Nairobi, Kenya
Telephone	+254 (0) 710 342 203
Email	daniel@takatakasolution.com

Organization name	South Pole Carbon Asset Management Ltd
Role in the project	Project Consultant
Contact person	Rohit Garg
Title	Regional Head – South Asia & Africa
Address	Technoparkstr 1, 8005 Zurich, Switzerland
Telephone	+41-43 501 35 50
Email	registration@southpole.com

1.5 Other Entities Involved in the Project

No other entities are involved in the project.

1.6 Ownership (3.4)

TakaTaka Solutions is the owner for both instances. Project Instances 1 & 2 operate on public and private leased lands for its collection in accordance with host country policies and laws. The mechanical recycling sites for both the instances are at the Ehothia site on private land.

Project proponents demonstrate that they have the legal right to control and operate project activities. Ownership documents in line with the Section 3.4.1 of the Plastic Waste Reduction Standard V1.0 shall be submitted later during validation of the activity.

1.7 Project Start Date (3.5)

The project start date is 01/01/2022. The records for the same will be submitted later during the validation.

1.8 Project Crediting Period (3.6)

The grouped project activity adopts a renewable crediting period of seven years which can be renewed for a maximum of twice. This start date of the crediting period will vary based on the

actual earliest commissioning/operation start date within the project activity instances of grouped project activity.

Crediting Period Start Date	Crediting Period End Date
January 1, 2022	December 31, 2028

1.9 Estimated Collected and/or Recycled Plastic Waste

Table 2: Estimated Annual Net Collected & Recycled quantities, Instance 1 (Start date: 01/01/2022, End Date: 31/12/2028)

Year	Estimated Net Collected Plastic Waste (tonnes)	Estimated Net Recycled Plastic Waste (tonnes)
Year 1	1,586	991
Year 2	4,807	3,005
Year 3	5,220	3,262
Year 4	5,769	3,606
Year 5	10,027	6,267
Year 6	11,126	6,954
Year 7	11,126	6,954
Total estimated amount	49,660	31,037
Total number of crediting years (where applicable)	7	7
Average annual amount	7,094	4,434

Table 3: Estimated Annual Net Collected & Recycled quantities, Instance 2 (Planned Start Date: 01/01/2024, End date 31/12/2028)

Year	Estimated Net Collected Plastic Waste (tonnes)	Estimated Net Recycled Plastic Waste (tonnes)
Year 1	4,340	2,713
Year 2	6,480	4,050
Year 3	7,035	4,397
Year 4	7,776	4,860
Year 5	13,515	8,447
Total estimated amount	39,145	24,465
Total number of crediting years (where applicable)	5	5
Average annual amount	7,829	4,893

1.10 Description of the Project Activity

This section will provide an overview of the project activity, broken down into two sub-sections:

1. Overview of the Project Objective and Set-Up
2. Overview of Collection and Recycling Models

1.10.1 Overview of the Objective and Set-Up:

The purpose of the project is to remove plastic waste from the environment through informal activities, to help the waste workers to achieve sustainable living, and to provide useful recycled material (pellets) to the manufacturer to reduce the usage of virgin plastic.

TTS PWRP Instances:

The TTS PWRP is split into two phases, or "instances". The first instance, Instance 1, refers to capacity and equipment installed and operational by the end of 2022. Instance 2 encompasses TTS investment and expansion plans in the following two years.

1.) **Instance 1:** TTS PWRP Instance 1 refers to current, operational sites and equipment, or those soon to be operational (by the end of 2022). The capacity of the washing lines and pelletizers 1, 2 & 3 is given in table 5.

2.) **Instance 2:** TTS plans on commissioning a new flexible washing line (at the same site as the existing recycling plant) and four more buyback centers across Kenya (Nakuru, Kakuma, Kisumu, and Mombasa). Pelletizers 4 & 5 will be installed by the end of 2024.

The table of plastics below summarizes the material to be targeted with the TTS PWRP.

Table 4: Plastic waste type targeted with the TTS PWRP

Additional Waste Categories Targeted	Plastic Type[4]
Rigid plastic	PP Thermoformed, PET Thermoformed, Polystyrene
Flexible plastic packaging	LDPE, HDPE, PP (including BoPP, woven and non-woven PP), multi-laminate packaging, PS.

TTS has three collection channels to source plastic waste:

1. Buyback centers (plastic waste sourced from waste collectors)
2. TTS sorting sites (commercial and residential waste)
3. Factory and manufacturing clients

TTS collects plastic waste from the sources above, which otherwise ends up in the environment. At dumpsites, open burning without energy recovery is common in Kenya's unsanitary landfills, contributing to air pollution and releasing greenhouse gases (GHGs) into the environment. Through its collection activities, the project reduces plastic waste entering open dumpsites and the environment. The collection sites are located in Dandora, Kitengela, Mombasa, Mlolongo, and Thika. More sites are planned in the following years, which will have the same standard

[4] Details of Material type(s) managed by the project in line with the VERRA standard is provided under section 1.2.

operating procedures. Collected plastics are taken to the TTS recycling facility for further sorting and processing at the Ehothia site

Baseline scenario: Cities across East Africa are growing rapidly; however, the waste management infrastructure to manage the increasing waste does not yet exist. Current waste disposal methods are extremely harmful to human and environmental health: 92% of plastic waste produced in the Kenya region is mismanaged[5] and less than 10% of overall waste is recycled. Thus, the penetration rates of plastic waste collection and recycling activities are less than 20% within the host country.

East African waste management is under the jurisdiction of local authorities. However, most local authorities have not prioritized the establishment of proper waste management systems as the councils/local authorities lack technical, institutional and financial capacities to manage waste. One of the major challenges[6] is a lack of funding, which has affected investment in waste management facilities and equipment in the host country. This has led to the current poor state of waste management, which includes indiscriminate dumping, uncollected waste and lack of waste segregation across the country. On average, worldwide, open burning accounts for 60% of uncollected plastic garbage and 13% of plastic waste at dump sites. In the case of Kenya, around 56%[7] of the total amount of plastic waste is openly burnt, leading to air pollution.

In the past, TTS has worked to remedy the East African waste problem, but never to the extent of the TTS PWRP initiative. TTS was active only in mixed waste collection from households and businesses, sorting and composting. The plastics now targeted under TTS PWRP could not be managed as there were no recyclers or alternative waste technologies able to manage the plastic types at the time. Hence, these materials were taken to the dumpsite for disposal.

The TTS flexible plastic waste recycling plant is the largest in Kenya. Rigid and flexible plastics are recycled into pellets, which are sold to local manufacturers to replace virgin plastic.

1.10.2 Overview of Collection and Recycling Models:

TTS PWRP collection operations

The processes involved in the TTS PWRP are: collecting mixed plastic waste from the three sources, and the transfer of this waste to the TTS recycling site for sorting and final recycling.

TTS has three collection channels to source plastic waste:

1) Buyback centers: Plastic waste is purchased from waste pickers at TTS buyback centers located near major unmanaged dumpsites. The collected plastic waste is then baled and taken to the TTS recycling plant.

   Waste pickers deliver plastic waste to each collection trading point that has its own site administration and quality control procedures in place. At each site, a Quality Control

[5] https://plastichotspotting.lifecycleinitiative.org/wp-content/uploads/2020/12/kenya_final_report_2020.pdf, page 5.
[6] http://meas.nema.go.ke/pops/download/National-Solid-Waste-Management-Strategy-_2.pdf, section 2.4.
[7] https://plastichotspotting.lifecycleinitiative.org/wp-content/uploads/2020/12/kenya_final_report_2020.pdf, page 24.

Assistant reviews the plastic collected against the sample buying list. The same Quality Control Assistant undertakes monitoring procedures, measuring and recording the weight and type of the plastic waste in the delivery notes and in the monitoring sheets. The weight excludes the sacks/nets the waste is brought in.

2) Sorting sites: TTS collection services gather mixed waste from residential and commercial clients. Mixed waste is taken to TTS sorting sites. Using conveyor belts and other machinery, trained staff sort the incoming waste into more than 40 different waste fractions: paper, cardboard, plastic containers and packaging, styrofoam, glass, metal, aluminum, shoes, textiles, and many more. Staff engaged in sorting activities are provided with a list of criteria to help them identify the required materials to proceed for recycling. It is a two-stage sorting process, one in buy-back centers, and other in sorting sites, to get the accurate material. Most material is compacted for easier storage, transport, and processing. Organic waste is processed in TTS composting facilities. Plastic waste is sent to the TTS plastic recycling plant. Remaining materials (such as paper, metals, glass) are sent to the third-party recyclers, where they are processed into new raw materials. Organic waste is processed in TTS composting facilities.

3) Factory clients: TTS operates on site with various manufacturing clients across Kenya to collect their waste, including plastics. The plastic waste is taken directly to the TTS recycling plant.

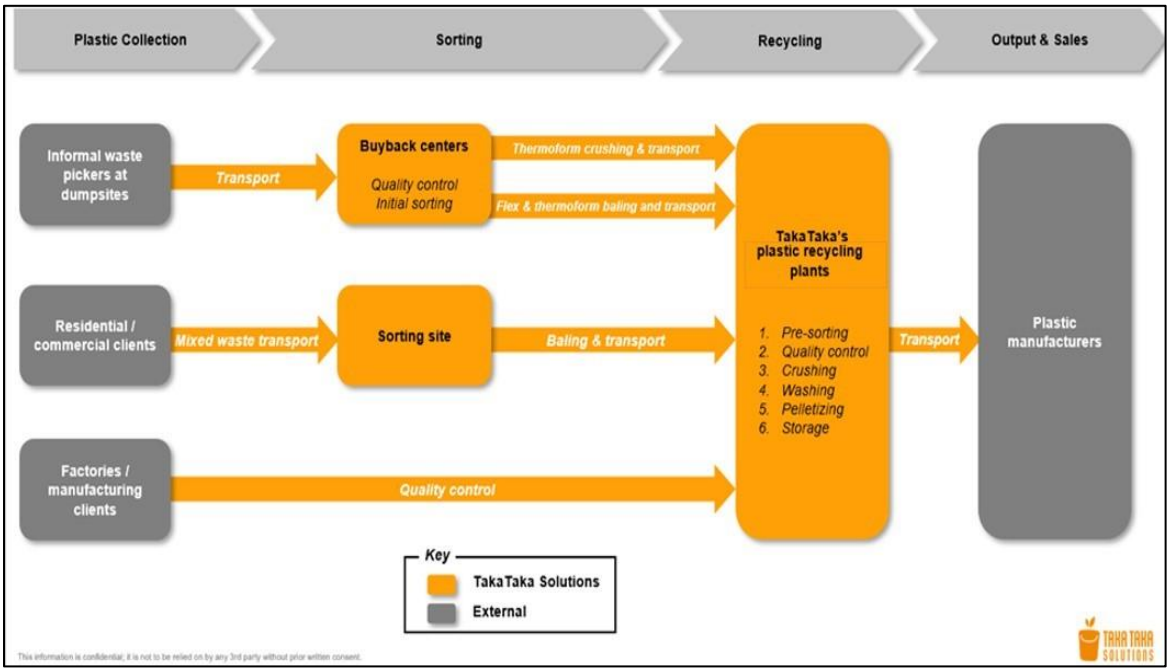

Figure 2: Flow of plastic waste through TakaTaka Solutions' operations



Above picture represents the collection activity in the collection sites.

TTS PWRP recycling operations

Once the specified additional plastic waste is collected (and sorted if necessary), it is transported to TTS recycling facilities. TTS has both a rigid and a flexible plastic washing line, along with pelletizing capabilities.

The TTS plastic recycling process (see below steps) is a mechanical one, first shredding and grinding incoming plastic for easier processing. The product is washed and dried to remove the impurities before being transformed into higher value plastic pellets. Plastic pellets are then sold to local manufacturers. At the TTS recycling site, plastic waste is monitored at each step of sorting, input to the washing line, and output of the pelletizer.

Leakage from the collection and recycling of plastic wastes are: Pre-sorting leakage, dirt and non-selected plastics, production waste leakage, sludge, these are taken to the landfill.



Figure 3: Flow of TakaTaka Solution's Mechanical Recycling operations



1. Truck entering the recycling site



2. Sorters sorting the waste on the conveyor



3. Baling team bales the fractions



4. Flexible recycle plant



5. Rigid Plastic Recycling



6. Flakes



7. Pellets

Above pictures represent the recycling activities in the recycling site.

Table 5: Major Equipment List

Type	Equipment	Make	Capacity (kg/hr)
Rigid washing line	Crusher	Bortech	650
	Friction washer	Bortech	650
	Hot washer	Bortech	650
	Rinsing tank	Bortech	650
	Zigzag separator	Bortech	650
	Packing station	Bortech	650
	Sorting platform	Bortech	650
	Screw conveyors	Bortech	650
Flexible washing line (current)	No hot wash	GET Recycling	800
	Shredder	GET Recycling	800
	Storage silo	GET Recycling	800
	Squeezer	GET Recycling	800

	Crusher	GET Recycling	800
	Friction washer	GET Recycling	800
	Rinsing tank	GET Recycling	800
	Zigzag separator	GET Recycling	800
	Packing station	GET Recycling	800
	Sorting platform	GET Recycling	800
	Screw conveyors	GET Recycling	800
Flexible washing line (new)	No hot wash	Lindner Washtech	1,600
	Shredder	Lindner Washtech	1,600
	Storage silo	Lindner Washtech	1,600
	Squeezer	Lindner Washtech	1,600
	Crusher	Lindner Washtech	1,600
	Friction washer	Lindner Washtech	1,600
	Rinsing tank	Lindner Washtech	1,600
	Zigzag separator	Lindner Washtech	1,600
	Packing station	Lindner Washtech	1,600
	Sorting platform	Lindner Washtech	1,600
	Screw conveyors	Lindner Washtech	1,600
Pelletizers, Instance 1	Pelletizer 1	Erema	250
	Pelletizer 2	Taiwan	400
	Pelletizer 3	NGR	500
Pelletizers, Instance 2	Pelletizer 4	Starlinger	1,200
	Pelletizer 5	Starlinger	350

The operational life of project equipment is considered to be 25 years as per industrial practice.

1.11 Project Location (3.7)

The project location and geographic boundaries are designated in the KML files attached as part of this document. At present, the collection and recycling centers have the following project location and geographic boundaries:

Table 6: Location and geographical boundaries of collection and recycling centers

Location	Latitude & Longitude

Mombasa – Buyback center: The town is known as the white and blue city in Kenya. It is the country's oldest and second-largest city, with a population of about 1,208,333 people according to the 2019 census.	3° 45' 8.64" S 39° 40' 1.344" E
Thika – Buyback Center: Thika is an industrial town and a major commerce hub in Kiambu County, Kenya, lying on the A2 road, 42 kilometers northeast of Nairobi.	1° 4' 37.992" S 37° 7' 2.604" E
Dandora – Buyback center: Dandora is an eastern suburb in Nairobi, Kenya. It is part of the Embakasi division.	1° 15' 1.26" S 36° 53' 40.884" E
Mlolongo – Buyback center: Mlolongo is a city in Machakos County, Kenya. Its population was estimated at about 136,000 people in 2019.[8] It is a satellite city of Nairobi and is part of the Nairobi metropolitan area.	1° 23' 24.936" S 36° 58' 32.88" E
Kitengela – Buyback center: Kitengela is a municipality in the Kajiado County of Kenya, located 50 kilometers south of the capital Nairobi, forming part of the greater Metropolitan Area.	1° 29' 35.88" S 36° 58' 2.928" E
Ehothia – Flexible and Rigid washing line and Mechanical Recycling unit	1° 08' 25.4" S 36° 43' 58.8" E

Four more buyback centers across Kenya (Nakuru, Kakuma, Kisumu, and Mombasa) are under planning. Their latitude and longitude shall be shared once confirmed.

1.12 Conditions Prior to Project Initiation

1.12.1 General Conditions

The baseline scenario is the same as the general conditions existing prior to the project initiation. Please refer to Section 3.5 (Plastic Waste Collection and/or Recycling Baseline Scenario) below.

1.12.2 Social and Environmental Conditions

Environmental Impact

According to Plastic Pollution Policy Country Profile: Kenya[9]: 92% of waste is mismanaged (Paruta et al., 2020), i.e., improperly disposed of in a landfill. In fact, there are no collection services in rural areas, which leads to leakage into terrestrial and marine ecosystems (Paruta et al., 2020).

- In terms of plastic, an estimated 37,000 tonnes of plastic leaks into the ocean every year, of which 67% comes from urban centers (Paruta et al., 2020). The problem is projected to get

[8] https://www.citypopulation.de/en/kenya/eastern/machakos/1610__mlolongo/
[9] https://nicholasinstitute.duke.edu/sites/default/files/projects/Plastic-Pollution-Policy-Country-Profile-Kenya.pdf

worse: by 2060, plastic generation will be 1.9 million metric tonnes per year (Lebreton and Andrady, 2019).

- Plastic pollution poses a major global threat to humans and the environment. At the present rate of population growth under a business-as-usual model, plastics production is estimated to double within the next 20 years in Kenya (Lebreton, 2019).
- Open burning of mismanaged plastic waste in Kenya poses significant risks for human health (due to the release of noxious chemical substances such as dioxin and particulate matters) and directly contributes to climate change.

This is the result of both a lack of collection services in rural areas and leakage in urban areas. According to Eunomia (2018), only 27% of plastic waste is collected, of which only 8% is recycled, while the remaining 19% is disposed of in an unsanitary landfill, a location where most solid waste is disposed of. In the Kenyan context, there are no sanitary landfills that include proper ecological precautionary measures such as wastewater treatment or landfill sealing. In many cases, it cannot be distinguished whether the disposal site is a landfill or dumpsite.

Dandora landfill, which is in the heart of the Nairobi slums of Korogocho, Baba Ndogo, Mathare, and Dandora, and which covers approximately 30 acres, is the destination of about 850 tonnes of solid waste generated daily by Nairobi, a city with a population of about 6.5 million people. Despite being declared full in 1996, dumping continues on the landfill[10].

Economic and Social Impacts

Informal waste pickers undertake a fundamental role in Kenyan society. These workers collect waste from homes, offices, streets, bins and skips, and markets, working at waste transfer stations in impoverished communities as well as illegal and legal dumpsites. Those who work in communities do so for a small fee, often collecting waste from homes and businesses. Many waste pickers live rough in informal settlements or are homeless. Dumpsite workers and waste pickers make a living by recovering materials that they sell to recyclers. These informal workers operate in very toxic environments and are often shunned by society, leading to social exclusion and mental health problems. The TTS PWRP not only supports in mitigating the environmental impact, but also generates jobs, provides sustained income and improved working conditions for these impoverished communities. All staff are provided with safe operating equipment (e.g., personal protective equipment [PPE]) and training.

In addition, the TTS PWRP runs additional programs to support workers engaged in the project. This includes hosting a kindergarten for young children to play while their parents are at work. Such systems enable sections of Kenyan society, such as women and single parents who may otherwise struggle to find child care and flexible work, to be employed.

[10] https://www.unep.org/news-and-stories/story/smoking-nairobi-landfill-jeopardizes-schoolchildrens-future



Figure 4 : Burning of waste in Dandora Landfill causing air pollution



Figure 5: Garbage collectors sort reusable materials at the Dandora landfill site on the outskirts of Kenya's capital, Nairobi

1.13 Compliance with Laws, Statutes and Other Regulatory Frameworks (3.1.3)

The TTS PWRP Instances complies with the environmental laws of Kenya. NEMA approves the project and provides the consent to operate, based on the following conditions:

- The project does not threaten endangered species.
- The project has a positive impact on the environment.
- The project respects the rights of workers.

Currently, the main law governing the environment in Kenya is the Environmental Management and Coordination Act, 1999 (EMCA) (Rev. Ed. 2018). Whilst EMCA has been instrumental in providing an enabling legal and institutional environment for the management of the environment, it has been unable to ensure that the country fully addresses present-day environmental challenges in the devolved system of government which is a feature of governance in Kenya. Various UNIDO/IUCN reports & public literature shared in above section 1. which has presented the poorly managed scenario of plastic waste collection/recycling in Kenya. Thus, it can be transparently depicted that the current situation of compliance rate in terms of collection & recycling rate of plastic waste is below 20% in the host country. Same has been elaborated in below section 3.5.

In Kenya, there was no mandatory EPR system regulated before the start date of the project. However, recently Kenyan government has come up with new regulations/bills discussed below:

Sustainable Waste Management Bill 2021[11]. Enacted by President Uhuru Kenyatta and passed by the National Assembly on 23rd Feb 2022, the 2021 legislation provides for the establishment of a Waste Management Board, mandatory extended producer responsibility programmes[12], recovery of household waste and the closure of illegal landfills in all 47 counties of the East African country.

Nonetheless, above regulations provide obligation for producer only and the TTS is not the producer but an independent private entity who is implementing this project activity on voluntary basis. The impact of latest amendment bills and regulations would require monitoring and evaluation on annual basis, and it will take time and efforts to achieve the objective of the laws. Thus, the project activity will provide strength in achieving the overall objective of the latest regulations.

[11] http://www.parliament.go.ke/sites/default/files/2022-05/The%20Sustainable%20Waste%20Management%20Bill%20%28%20National%20Assembly%20Bills%20No.%2022%29%202021.pdf

[12] https://www.wwfkenya.org/faqs_on_epr_regulations_2021/

1.14 Additional Information Relevant to the Project

Commercially Sensitive Information (3.2.2)

The Stakeholder Consultation Meetings list has been removed due to names and contact details being supplied.

Further Information

1) Environmental conditions of the project area

The TTS PWRP helps to improve the environment through the following activities:

It reduces the presence of waste in the environment and landfills, reducing potential harm to fauna and flora.

It promotes community management and raises awareness of waste and ecosystem management at a local and global level.

2) Socio-economic impact assessment

Socio-economic impacts of the project have been assessed by the TTS during the project design to ensure integrated benefit for communities and ecosystems.

The proposed activities have no significant negative social impacts. The project involves collectors and recyclers. To be successful, project activities were designed to respond to the local challenges and development perspectives of these collectors and recyclers.

Socio-economic benefits

The project's mission is to build an integrated waste management system that maximizes recycling at scale and provides women and youth with employment, education, and social resources and tries to achieve SDG 1, SDG 3, SDG 5 and SDG 8. Around 450+ staff are employed, of which 50% are female.

TTS contributes to the sustainable development of surrounding communities, offering social and economic benefits. This includes increased job opportunities and a boost in local and regional economies. The project creates a social impact of 300 direct jobs and 3,000 jobs created indirectly. Furthermore, as detailed in Section 1.12.2, the project creates additional jobs, provides sustained income to workers, and improves working conditions.

Furthermore, workers benefit from social programs run by the TTS PWRP, including access to the project’s kindergarten for workers with young children.

TTS tracks job data through contracts signed for direct jobs, while indirect jobs are estimated based on waste quantities and survey data. TTS tracks social benefits through issuance records.

2 STAKEHOLDER ENGAGEMENT AND SAFEGUARDS

2.1 Stakeholder Engagement (3.13)

2.1.1 Stakeholder Identification (3.13.1)

Stakeholders are any individuals, companies, organizations or government entities who either impact or are impacted upon by TTS PWRP activities at any stage in the process, from recruitment of collectors to recycling processes.

Stakeholders are identified through online research, networking and word-of-mouth. All entities linked to TTS's operations and network must comply with the Code of Conduct, which includes strict standards for employees.

2.1.2 Stakeholder Description (3.13.2 – 3.13.3)

There are four key stakeholder groups relevant to this project

1) Waste pickers: The waste collectors are employed and paid to collect waste. All waste collectors are local to the buyback centers and also benefit from the cleaner local environment.

2) Recyclers: Recyclers are the local people who are employed in the recycling sites for sorting and recycling and who benefit from the healthy work environment.

3) Local community: The local population is affected by plastic pollution, and therefore shares in the benefits of the project. These communities are usually not registered with a formal waste collection service provided by the government or other entity.

4) NGOs: NGOs such as the Kenya Association of Waste Recyclers, Trash Care Services, which care about the environment, waste collectors, and recyclers, are also impacted by the project.

2.1.3 Stakeholder Consultation (3.13.4 – 3.13.8)

Stakeholders identified in Section 2.1.2 have been and will continue to be notified of the project development process. As many of these collectors may be marginalized or vulnerable, the team works closely on the ground year-round. This means developing close relationships with each stakeholder; contact details of the TTS representative are shared with collectors in case of any direct concerns and queries.

All stakeholders are welcome to evaluate and raise concerns about any potential negative impacts or to suggest desired outcomes of the project. We welcome them to share any input for the project to improve its productivity and positive impact.

A stakeholder consultation meeting was conducted in Nairobi on August 5, 2022 in line with the requirement of Plastic Waste Reduction Standard. The Stakeholder's consultation process included face-to-face meetings with waste pickers, collectors, women's groups that collected, washed and sorted the plastic, and the day workers,

The TTS PWRP instance and issuance of plastic credits was explained to the stakeholders as well as the process in place to validate and expand the work performed by the stakeholders. Stakeholders were interviewed by the TTS team to better understand the work they do and how they have benefited by the collection of plastic waste in Kenya. Stakeholders were asked to provide feedback on how their collecting or recycling activities could be improved if plastic credits were issued and if there were additional financing for plastic collection and recycling operations.

Stakeholder meetings are recorded by TTS, and everyone present signs the attendance records. All feedback is shared with the TTS representative who evaluates the impact, positively and negatively and from here assesses how this feedback can be used to improve the program.

All stakeholders were happy and appreciated the TTS sustainable project activity and requested the development of more such infrastructures and projects to achieve the dual objective of environmental benefits and community social development.



Figure 6 : Pictures clicked during the stakeholder consulatation.

2.1.4 Free, Prior and Informed Consent (3.13.6)

No property rights are impacted by the TTS PWRP Instances as TTS obtains consent from those whose property rights will be affected by the project in the form lease licenses as per the law.

TTS have a signed agreement with the owner of the land acknowledging that they permit the recycling activities to take place[13].

Additionally, a helpline number and email id are shared to register your feedback at any point of time during the crediting period.

2.1.5 Continued Consultation and Adaptive Management (3.13.9)

TTS is in constant contact and takes an adaptive approach to project management. The team remains in communication on the ground on an ongoing basis and a continuous feedback/grievance mechanism is maintained by TTS.

2.1.6 Anti-Discrimination (3.13.10)

TTS operates a strict anti-discrimination policy. Any entity wishing to become part of the program must work in line with the TTS Code of Conduct. Decisions about hiring, salary, benefits, training opportunities, work assignments, advancement, discipline, and termination must be based solely on the ability to perform the job, rather than based on personal characteristics or beliefs, such as race, national origin, gender, religion, age, disability, marital status, parental status, association membership, sexual orientation or political opinion.

2.1.7 Feedback and Grievance Redress Procedure (3.13.11)

As part of our feedback and grievance redress procedure, all stakeholders involved in the project can give feedback directly to representatives of TTS via any of our contact details, which are shared publicly on the TTS website as well as at all the buyback centers and recycling sites. Communication is usually via email or phone.

For feedback directly related to TTS operations, we endeavor to answer any feedback and queries. TTS's grievance mechanism procedure is well established at each location.

2.1.8 Feedback and Grievance Redress Procedure Accessibility (3.13.12)

Our contact information is available publicly on the TTS website[14]. We also give out contact details via email and phone to all the communities and people that we meet, which they can use to give feedback or convey grievances to TTS.

2.1.9 Stakeholder Access to Project Documentation (3.13.13)

The Project Description and Monitoring reports will be available via the Verra Registry once the project is registered under the Plastic Waste Reduction Standard v1.0. Stakeholders will be directed there for information on the project. TTS operates on a transparent policy.

[13] Lease Agreements.

[14] https://takatakasolutions.com/contact/

2.1.10 Information to Stakeholders on Validation and Verification Process (3.13.14)

All relevant stakeholders shall be informed verbally and/or in writing about the upcoming verification and validation process used by the Plastic Program, and all relevant stakeholders have agreed to provide information and be cooperative in this process.

TTS representatives will communicate to stakeholders at least five working days in advance of the site visit by the validation/verification body. TTS representatives will be available to facilitate on-site communication, or if the assessor wishes to communicate directly and independently with stakeholders then TTS will provide direct contact details to the assessor via email or phone.

2.2 Public Comments (3.13.15 – 3.13.18)

Section to be completed after the 30-day public comment period.

2.3 Safeguards (3.14)

The program aims to reduce the amount of plastic waste that stays within the environment through the collection and recycling of as much plastic waste as possible to limit the impact on nature. The program aims to reduce the amount of waste incinerated in landfills. It aims to increase the production of plastic pellets, which can be used in place of virgin plastic.

2.3.1 Health and Safety (3.14.2 – 3.14.3)

- Potential health impacts as a result of the project activity in the project boundary:

  ✓ Negative health impacts may occur during the collection of the waste by the waste pickers. These are mitigated by receiving PPE. Uniforms, gloves, anti-dust masks, protective glasses, safety shoes and earmuffs. These help to ensure that each employee's health is protected, and limit exposure to risks.

- Potential hazards and safety risks associated with the implementation of the project activity:

  ✓ Potential hazards and risks may occur during the collection and recycling of the waste by rag pickers and the employees working in the recycling facility. Other health impacts include lifting loads, working with heavy machinery, and potentially hazardous waste materials in the workplace. Training is provided to employees to mitigate these risks.

  ✓ There are safety risks and toxic waste hazards that may occur during the collection of the waste by local collectors. These are best mitigated through training of the collectors about safe areas and methods to collect.

2.3.2 Labor (3.14.4 – 3.14.8)

- TTS PWRP complies with labor and human rights laws and practices followed in the host country.

✓ TTS has policies on compliance with relevant laws, compensation to project actors, and the prohibition of child labor in the project activity.

✓ The staff and laborers are not asked to work in conditions that directly impact their health, safety, or religious values. There will be no child labor involved in the project.

- Increased recycling of plastic waste will lead to an increase in work and jobs.

✓ Disadvantaged communities already involved in the waste collection are the priority targeted beneficiaries of the project, hence mitigating potential social negative impacts as we do not enter into competition with local engaged stakeholders but instead work with them to incentivize them and support their efforts and working conditions.

2.3.3 Energy Efficiency and Greenhouse Gases (3.14.9 – 3.14.13)

The main source of GHG emissions is the energy consumption of machinery used in the recycling facilities and the transportation involved in the project activity. The recycling of collected plastics means that there are no emissions from the production of virgin plastics, while the open burning of plastic waste and the presence of plastics in landfills are reduced; therefore, these are considered as saved emissions.

Table 7: TTS GHG emission reduction calculation

A.	**Major source of GHG emissions because of project activity (Project Emission)**
1	Electricity consumption in recycling of plastic waste
2	Transportation of plastic waste and recycled products
B.	**GHG emissions avoidance due to the project activity (Emission Saved)**
1	Open burning of plastic waste and the presence of plastics in landfills
2	Replacement of virgin plastic

Table 8: Project Instance 1

Year	Project Emission	Emission Saved	tCO_2e emitted – tCO_2 avoided (tonnes)
1	208	1,935	-1,727
2	629	5,867	-5,238
3	683	6,370	-5,687
4	755	7,040	-6,285
5	1,312	12,236	-10,924
6	1,456	13,577	-12,121

7	1,456	13,577	-12,121
Total	**6,499**	**60,603**	**-54,104**

Table 9: Project Instance 2

Year	Project Emission	Emission Saved	tCO_2e emitted – tCO_2 avoided (tonnes)
1	568	5,297	-4,728
2	848	7,907	-7,509
3	921	8,585	-7,664
4	1,018	9,489	-8,471
5	1,769	16,493	-14,724
Total	**5,123**	**47,771**	**-42,648**

Detailed calculations are provided in the excel sheet.

2.3.4 Condition of Natural Resources (3.14.14 – 3.14.15)

- Air quality impacts as a result of the project activity in the project boundary:

  ✓ Impact on air: reduction of open dumping and open burning of plastic waste, hence reduced impact on air quality, reduced impact on animal and human health. The burning of plastics releases toxic gases such as dioxins, furans, mercury, and polychlorinated biphenyls (better known as PCBs) into the atmosphere, which pose a threat to vegetation, and human and animal health.

- Water quantity and quality impacts as a result of the project activity in the project boundary:

  ✓ Impact on water resources: reduction of water pollution. Groundwater is recharged by the slow filtration of surface water through the porous layers of soil, and as these systems are open, they are susceptible to contamination by pollutants. Project activity will help in reducing the impact.

- Soil quality impacts as a result of the project activity in the project boundary:

  ✓ Impact on soils: reduction of soil pollution. Among these pollutants are microplastics which, in addition to polluting the oceans and surface waters, can then pass through the soil and pollute the groundwater. In addition, when the plastic stays in the soil for too long and degrades, plants are unable to grow there.

- Biodiversity and ecosystem health impacts as a result of the project activity in the project boundary:

✓ Impact on biodiversity: reduction of the impact on animal and plant health, in particular improved coral and marine biodiversity due to reduced plastic debris.

✓ Reduced impact on threatened and endangered species as a reduction in ocean plastic debris reduces the risk of species dying as a result of pollution.

Thus, the project brings a positive impact on natural resources quality in and around the project boundary.

2.3.5 Additional Impact Certifications (3.14.16)

All of the positive social and environmental impacts of the project are quantified through the Plastic Waste Reduction Standard. Additional certification standards are not used.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology (3.1.2)

PWRM0001 Plastic Waste Collection Methodology Version 1.1[15]

PWRM0002 Plastic Waste Recycling Methodology version 1.1[16]

Tools Applied: Tool for the demonstration and assessment of additionality[17]

3.2 Applicability of Methodology

Justifications of the choice of the methodology are provided below.

PWRM0001, version 1.1: The Methodology is applicable when all the following conditions are met:

Table 10: Applicability paragraph and its justification

Applicability Para	Justification
4.1.a	The TTS PWRP Instances 1 & 2 involve collection of waste from the "Informal Sector". Collection of plastic waste by the informal sector for recycling or other waste management purposes. The sources are: • buyback centers; • sorting sites; and • Factory clients.

[15] https://verra.org/wp-content/uploads/2022/06/PWRM0001_Plastic-Waste-Collection-Methodology-v1.1.pdf
[16] https://verra.org/wp-content/uploads/2022/06/PWRM0002_Plastic-Waste-Recycling-Methodology-v1.1.pdf
[17] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf

4.2	The collection activity is a new activity carried out for the recycling of plastic waste in TTS recycling plant at Ehothia; this results in significant increases in the collection of plastic waste.
4.3	The sources of the collected waste are clearly identifiable and are existing or potential sources of plastic waste that would have been left or dumped in the environment or openly burned in the absence of the project activity. This can be demonstrated by using the most recent official government data, third-party independent surveys and research, academic research/papers and independent market research. NATIONAL GUIDANCE FOR PLASTIC POLLUTION HOTSPOTTING AND SHAPING ACTION – Final Report for Kenya, December 2020
4.4	The collected waste is sorted by type, weighed and transferred to a mechanical recycling facility at Ehothia, where it is processed into pellets and sold to plastic manufacturing facilities.
4.5	The dry weight of the final output of collected plastic waste that reaches to TTS PWRP Instance 1 & 2 mechanical recycling facility is directly measured and recorded. Evidence such as sales invoices generated by the project proponent or goods receipt notes generated by the plastic waste recipient are available.
4.6	The output of the collection activity is not used in any unauthorized, illegal or non-statutory activities within the project boundary. Payment invoices are recorded and used to verify that the collected waste goes to the recycling facilities.
4.7	The waste material collected in the project activity is taken to an end-of-life facility defined as in the TTS PWRP Instances 1 & 2 as a mechanical recycling facility where the collected waste is reprocessed into plastic pellets and/or flakes.
4.8	The availability of plastic waste is demonstrated by defining the baseline scenario and using the most recent publicly available data on plastic waste.
4.9	Plastic waste collection and recycling are negligible in scope due to a lack of formal waste collection services and coordinated government resources. As defined in the project eligibility, the plastic waste recovery is below 20%. Therefore, the project activities do not compete with other collection activities. Contrarily, it expands and enhances formal collection in cities and towns with low formal collection and high plastic leakage. Please refer to Section 3.5 for further information.
4.10	Plastic waste collected in the project activity is taken to an end-of-life facility i.e the project mechanical recycling facility. Also, not recycled or is lost during the recycling process (e.g., due to contamination) is managed in a way that does not include dumping on open land, in water bodies and/or at dumpsites; open burning; or incineration without energy recovery. Contaminated plastic waste is either not accepted by the recycling facilities or is stored for later disposal by the authorized agency as per the relevant regulations. Records are maintained by the TTS.

4.11	The collected plastic waste is mechanically recycled/reprocessed into plastic pellets and/or flakes within the host country i.e. Kenya. Thus, transboundary movement of collected plastic waste does not occur between the countries.

PWRM0002, version 1.1: The Methodology is applicable when all the following conditions are met:

Table 11: Applicability paragraph and its justification

Applicability Para	Justification
4.1.a	The TTS PWRP Instances 1 & 2 involve the installation and operation of a new mechanical recycling facility for collected plastic waste.
4.2	The plastic waste is collected from the environment: untreated landfills, open dumpsites, public areas, streets, near waterways, industries as well as through buyback centers as explained above in Section 1.10.
4.3	The TTS PWRP Instances 1 & 2 involve the installation and operation of a new mechanical recycling facility for collected plastic waste.
4.4	The collected waste is sorted by type, weighed and transferred to a mechanical recycling facility at Ehothia, where it is processed into pellets and sold to plastic manufacturing facilities. The intent of sorting is to ensure that only relevant plastic waste enters the recycling process. It also aims to ensure increased efficiency of plastic waste recovery. The sorting process description include: a) the source of the plastic waste; b) the technologies and methods used to sort the plastic waste; c) a detailed description of the sorting criteria; and d) the expected material composition of output waste streams post-sorting.
4.5	Plastic waste intended for recycling is not mixed with hazardous materials or substances (e.g., coatings, adhesives or colorants) that could become unsafe. Any plastic waste contains hazardous materials or substances, and must be treated following the relevant national, regional and local regulations.
4.6	The different types of plastic are recycled separately and the final output of the recycling facilities is measured and recorded. The plastic, after being recycled into pellets, is placed into bags of different weights for sale to plastic manufacturers.
4.7	The quality of the recycled plastic waste allows it to be used as feedstock in the manufacture of recycled products, thereby displacing the use of virgin plastic. Credible evidence can be provided specifically on the sale of recycled plastic to plastic manufacturers. The recycled plastic pellets are sold in bags to manufacturers. All sales receipts are processed and stored.
4.8	The availability of plastic waste is demonstrated by defining the baseline scenario and using the most recent publicly available data on plastic waste.

4.9	TTS PWRP Instances 1 & 2 do not include any depolymerization of sorted plastic waste streams.
4.10	As defined in the project eligibility criteria for additionality, the plastic waste recovery is below 20%. Therefore, the project activities do not compete with other collection activities. The availability of plastic waste is demonstrated by defining the baseline scenario and using the most recent publicly available data on plastic waste. Without the project activities, there would be mismanaged plastic waste, which would be at significant risk of entering the ocean. Thus, the TTS PWRP Instances 1 & 2 do not divert plastic waste from any historically existing, legally recognized recycling activity.
4.11	Plastic waste that enters the project recycling facility but is not recycled or is lost during the recycling process (e.g., due to contamination) is managed in a way that does not include dumping on open land, in water bodies and/or at dumpsites; open burning; or incineration without energy recovery. Contaminated plastic waste is either not accepted by the recycling facilities or is stored for later disposal by the authorized agency as per the relevant regulations. Records are maintained by the TTS.
4.12	This grouped project activity does not involve any import from other countries. However, if either or both circumstances mentioned in PWRM0002 v1.1 exists, a robust and transparent chain of custody from the source of plastic waste to the end destination of the project activity shall be provided in line with the applicable methodology.

Applicability of Tool: In line with the PWRM0001 & PWRM0002, Version 1.1.

Step 3b: Project Method – Investment Analysis, the latest approved versions of the methodological tools for demonstration and assessment of additionality and investment analysis must be used when applying this step.

3.3 Project Boundary (3.8)

Table 12: Project Boundary

Source		Material Type	End-of-Life	Explanation
Baseline	Unregulated disposal sites	Other plastics (O)	General environment: public areas, streets, open dumpsites, unregulated and untreated landfill, open burning and leaking back	Minimal to no collection activities depending on region. Plastic waste is mainly found in the environment. In Kenya, the landfill is an unsanitary landfill, regulated by the government, and the mismanagement rate is high, so, there is a chance of leakage of plastics back into the environment, and the incineration of waste is predominant in landfills, causing air pollution.
		PVC		
		PP		
		PET		

Source		Material Type	End-of-Life	Explanation
		HDPE	into the environment, and incineration without energy recovery	
		LDPE		
		PS		
	Environment	Other plastics (O)		
		PVC	Environment, possibly recycled or taken to a landfill	
		PP		
		PET		
		HDPE		
		LDPE		
		PS		
Project	Unregulated disposal sites	Other plastics (O)	-	-
		PVC	-	-
		PP	Recycled into pellets	Through mechanical recycling, it is made into flakes, and then into pellets, and sold for manufacturing units. The plastics which are collected but not recycled are sent to the landfills.
		PET	Recycled into pellets	
		LDPE	Recycled into pellets	
		HDPE	Recycled into pellets	

Source		Material Type	End-of-Life	Explanation
		Other plastics (O)	-	
	Project	PVC	-	-
		PP	Recycled into pellets	Through mechanical recycling, it is made into flakes, and then into pellets, and sold for manufacturing units. The plastics which are collected but not recycled are sent to the landfills.
		PET	Recycled into pellets	
		LDPE	Recycled into pellets	
		HDPE	Recycled into pellets	

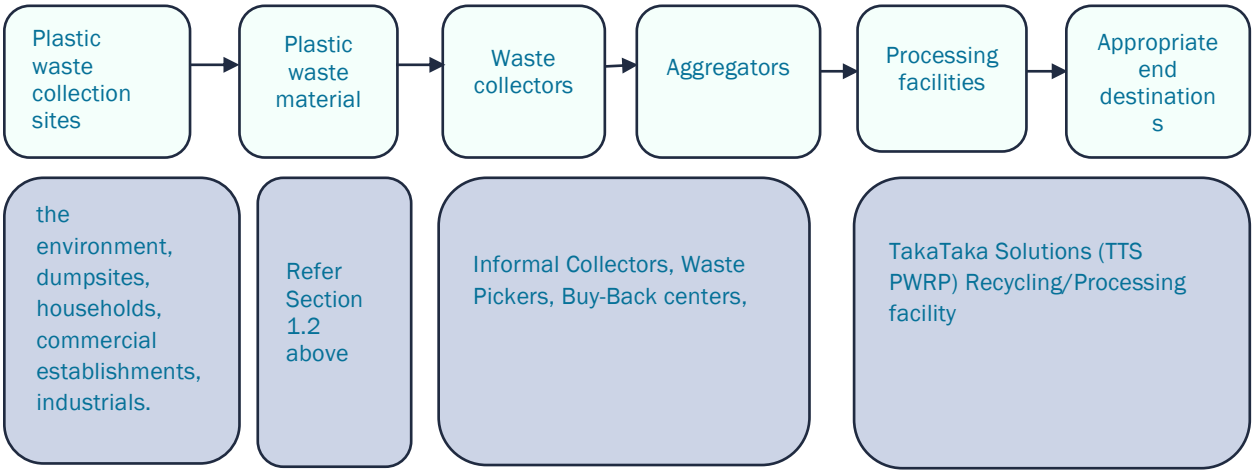

Figure 7: Project boundary diagram of collection methodology (PWRM0001)

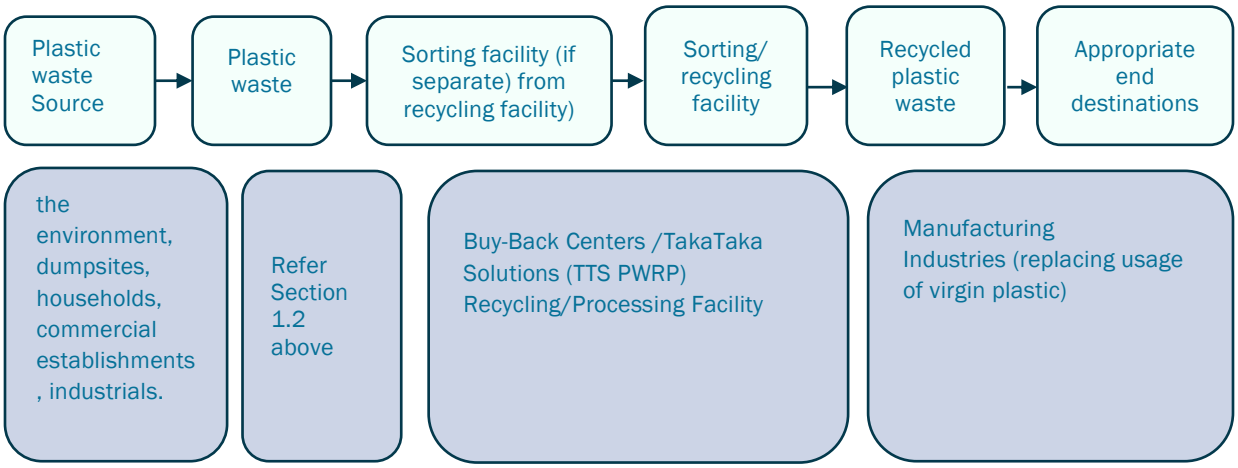

Figure 8: Project boundary diagram of recycling methodology (PWRM0002)

3.4 Project Region

The project operates in Kenya in the regions previously outlined in detail in the Section 1.11.

3.5 Plastic Waste Collection and/or Recycling Baseline Scenario (3.9)

3.5.1 The overall situation of waste management in Kenya

In Kenya, waste management challenges include excessive plastic use and a lack of industrial waste treatment equipment and methods. Plastic waste currently constitutes a big challenge to solid waste management in the country. National Guidance for Plastic Pollution Hot spotting and Shaping Action, 2020 Report[18] for Kenya reveals that 92% of plastic waste produced in the Kenya region is mismanaged and less than 10% of the plastic waste is recycled.





[18] https://plastichotspotting.lifecycleinitiative.org/wp-content/uploads/2020/12/kenya_final_report_2020.pdf, page 5.





Polymer Type	Waste produced in country	Domestic recycling of collected	Export of collected	Properly disposed	Improperly disposed	Uncollected	Tot	Collected	Mismanaged	Leaked	Waste produced and imported	Domestic recycling incl imported
PET	44	10%	3%	0%	21%	66%	100%	34%	87%	12%	44	11%
PP	109	5%	1%	0%	19%	74%	100%	26%	94%	9%	110	6%
Polyester	113	0%	0%	0%	23%	77%	100%	23%	100%	5%	113	0%
LDPE	53	15%	2%	0%	18%	64%	100%	36%	83%	10%	53	16%
HDPE	52	19%	2%	0%	16%	63%	100%	37%	79%	8%	53	20%
PS	5	0%	0%	0%	18%	82%	100%	18%	100%	8%	5	1%
Other	69	4%	1%	0%	18%	77%	100%	23%	95%	5%	69	4%
Synthetic Rubber	24	8%	0%	0%	21%	71%	100%	29%	92%	7%	24	8%
PVC	35	1%	0%	0%	13%	86%	100%	14%	99%	4%	35	1%
All	503	7%	1%	0%	19%	73%	100%	27%	92%	7%	506	7%

Figure 9: Kenya Plastic Waste Detailed Share by Polymer[19]

Archetypes	Population 2020	Generated t	Collected t	Collected for recycling t	Properly disposed t	Improperly disposed t	Uncollected t	Mismanaged t	Leaked t	Generated kg/hab	Collected for recycling kg/hab	Mismanaged kg/hab	Share of collected	Share of mismanaged
Mombasa	665449	19915	14275	3799	0	10475	5641	16116	1010	29.9	5.7	24.2	72%	81%
Kisumu	400942	11999	4231	2289	0	1942	7768	9710	498	29.9	5.7	24.2	35%	81%
Nakuru	846194	25324	14053	4831	0	9222	11271	20493	1204	29.9	5.7	24.2	55%	81%
Nairobi	4782357	143124	85736	27305	0	58430	57388	115818	11582	29.9	5.7	24.2	60%	81%
Urban other	3903692	116828	23366	0	0	23366	93462	116828	9210	29.9	0.0	29.9	20%	100%
Rural	43535850	185577	0	0	0	0	185577	185577	11634	4.3	0.0	4.3	0%	100%

Figure 10: Waste Management by Geographical Archetype[20]

Poor plastic waste management contributes to poor air quality, ocean toxicity, and ecosystem disruption. Plastic is poisonous and some of its ingredients such as bisphenol-A and phthalates have been proved to cause cancer, birth defects, impaired immunity, endocrine disruption, and

[19] https://plastichotspotting.lifecycleinitiative.org/wp-content/uploads/2020/12/kenya_final_report_2020.pdf, page 75.
[20] https://plastichotspotting.lifecycleinitiative.org/wp-content/uploads/2020/12/kenya_final_report_2020.pdf, page 76.

other ailments[21]. Living near dumpsites, such as the Mwakirunge dumpsite in Mombasa, has been linked to serious illnesses like malaria, diarrhea, and infections of the respiratory system. Most of this trash ends up as environmental litter, and is washed by rainwater into the Indian Ocean, while some of it clogs drainage systems.[22]

Kenya's population is estimated to be around 56 million people. The metropolitan area around Nairobi, which mostly encompasses the counties of Kiambu and Machakos, has a population of up to six million people; Nairobi itself has a population of roughly 4.6 million (UN Habitat, 2019). Mombasa, the second largest city in Kenya, has a population of over one million people and is a major commercial and logistical hub, as evidenced by its role as the principal port for several East African countries. The trash generation statistics reflect Kenya's features as a fast-developing country. On average, 0.39 kilograms of garbage are generated per capita every day, compared to 2.7 kg in Germany (OECD, 2017; World Bank, 2018). In the Greater Nairobi areas, Kenya's political and economic hub, 3,000 mt or 0.64 kg per capita of municipal waste occurs daily from residential areas, industry, and other private companies as well as public institutions (UN Habitat, 2019), a slight increase since the estimates by JICA (2010). According to JICA (2010), plastic fractions account for 9.5%. Recent data collection carried out by UN-Habitat (2019) assumes plastic content in a range of 9% to 15%, specified as per different income levels in Nairobi; countrywide data is not available. Lower-income areas count relatively lower volumes of plastics. On the other hand, high-income areas account for the highest volumes of plastics. Middle-income areas are, by far, the most relevant areas in terms of the absolute volume of plastics in municipal solid waste. Due to its function as the economic and political hub, a significant number of Kenya's high-income areas are concentrated in Nairobi. Putting all these findings together, plastics account for the largest share of municipal solid waste after organic waste and paper. These volumes predominantly originate from plastic packaging including traded and locally manufactured goods (Eunomia, 2018).

The Kenyan economy's expanding industrialization exacerbates this tendency. Despite the presence of waste management laws and rules, inadequate implementation and practices have resulted in towns and cities becoming overrun by their trash, consequently affecting public health and the environment. Most municipal governments have not placed a high priority on the construction of proper waste management systems, dedicating limited resources to their administration. Furthermore, the councils have lacked waste management technical and institutional capabilities. This has resulted in the current state of waste management in the country, which includes indiscriminate dumping, uncollected waste, and a lack of waste segmentation. This project is the **first recycling plant** in Kenya for single-use plastics (trays, cups, etc.), demand for previously unrecyclable single-use plastics in Kenya for recycling is in line with Vision 2030 and the new circular economy Waste Management Bill[23].

[21] http://www.greenbeltmovement.org/
[22] A detailed study of plastic waste management in one of the slums in Mombasa, Kenya is found here: A case study of muoroto slum, Mombasa, Kenya.
[23] Kenya's circular economy model

Kenya does not currently produce virgin plastics. The sole facility that might conceivably turn raw materials into plastic base goods – a crude oil refinery in Mombasa – has been shut down for years. To be used in plastics, the (limited) indigenous crude oil must be processed elsewhere.

Waste transportation is largely rudimentary, using open trucks, hand carts, and donkey carts, among others. These poor transportation modes have led to littering, making waste an eyesore, particularly plastics in the environment. Disposal of waste in the country remains a major challenge as most counties lack proper and adequate disposal sites. The few towns that have designated sites practice open dumping of mixed waste as they lack appropriate technologies and disposal facilities. To address this situation, NEMA directed all county governments to designate areas of waste disposal and undertake basic actions to manage the sites, including fencing, manning, and weighing the waste[24].

The current waste management practices in Kenya can be described as nascent. The current deficiencies have historically grown and are based on a combination of political, economic, social, and technical factors. The current waste management system is evolving significantly and needs concerted action from different government levels and private companies as well as civil society.

Thus, the baseline scenario for the TTS PWRP is that in which, "without project implementation, the plastic waste would have remained in the environment, been disposed of by open burning, been incinerated without energy recovery and/or disposed of in a dumpsite and the plastic waste would not have been recycled" to replace the usage of virgin plastic.

In 2022, the TTS PWRP Instance 1 would collect 1,586 tonnes of plastic and as such recycle 991 tonnes into valuable pellets for plastic manufacturers. With plastic credits, the project will be able to increase this amount threefold and significantly increase the amount of plastic collected and recycled in Kenya.

3.6 Additionality (3.10)

As explained in the baseline scenario above, it is evident that plastic waste is highly mismanaged in the host country. The areas considered for the project activity is that the waste collection and recycling system is deficient, ill-equipped, and shows very low levels of collection and recycling. The communities and local authorities lack financial resources and equipment as well as economic incentives to develop and maintain a proper waste collection and recycling system.

Without the project activities, these volumes of plastics would not be collected and would remain in the environment or landfill. Public and private players do not have the sufficient technical and financial means to tackle the plastic issue at scale, so there is a need to invest in an incentive to help these remote and disadvantaged communities manage the problem by launching or reinforcing the plastic recovery and recycling supply chains at local and regional levels. The penetration and promotion of such management activities are key to improve waste management

[24] https://www.businessdailyafrica.com/bd/data-hub/garbage-pain-grows-as-dumping-tops-green-collar-crimes--2200512

and to provide socioeconomic benefits to the community, while addressing the global environmental impact of plastic pollution and the overall socioeconomic benefit of community. The finance received from plastic credits will thus support the operational cost and the expansion of collection and recycling activities.

a) Demonstration of collection additionality through PWRM0001 V1.1:

Based on the PWRM, collection additionality can also be demonstrated from the following:

Step 1: As explained in section 1.13 above, there are no laws or regulations that enforce the collection of the relevant material type(s) or the laws or regulations are not systematically enforced and noncompliance is widespread in the relevant country or region.

Proceed to Step 2 (Outcome 1: Project Instance is a voluntary activity, and no laws enforce the implementation of the activity.)

Step 2: Activity Method – Positive List:

Outcome 2: The project activity is not included in the positive list. Proceed to Step 3a (penetration rate).

Step 3a: Project Method – Penetration Rate of Collection Activities

The penetration rate (percent) is given as the ratio between plastic waste collection (tonnes/year) and plastic waste production (tonnes/year) in the region. If this penetration rate is below 20%, the project activity is additional.

Any data or studies used in Step 3a to determine the penetration rate must be no more than three years old at the time of validation. The National Guidance for Plastic Pollution Hot spotting and Shaping Action, Final Report December 2020[25] states that the penetration rate of recycling activities is less than 20%. Specifically, 8% of total collected plastic waste recycled in the host country and 92% of plastic waste remains unmanaged (i.e., 73% uncollected and 19% improperly disposed). This applies to all plastic waste types in Kenya. Thus, the project activity is additional.

Outcome: the project activity has a penetration rate less than 20%. Thus, the project activity is additional.

Proceed to Step 3b (investment analysis).

Step 3b: Project Method – Investment Analysis

The project is additional due to the penetration rate being below 20%. An investment analysis is also conducted in line with the Investment tool guideline and tool to calculate the additionality of the project. The return from the project is evaluated to understand the risk associated with the investment. It is found that the financial indicator (i.e., EIRR) is much below the benchmark and

[25] https://plastichotspotting.lifecycleinitiative.org/wp-content/uploads/2020/12/kenya_final_report_2020.pdf, page 75.

it is not expected to cross the benchmark with the reasonable variation in the key parameters. The analysis sheet will be shared with the auditors during the validation of the project.

b) Demonstration of recycling additionality through PWRM0002 Versions 1.1:

Step 1: Regulatory Surplus:

As explained in the above sections, there are no laws or regulations that enforce recycling of the relevant material type(s) or the laws or regulations are not systematically enforced and noncompliance is widespread in the relevant country or region. Proceed to Step 2 (Outcome 1).

Step 2: Activity Method – Positive List

The project activity is not included in the positive list. Proceed to Step 3a (penetration rate).

Step 3a: Project Method – Penetration Rate of Recycling Activities

Total generation (G, tonnes/year), and recycling capacity of plastic waste (C, tonnes/year) in the region:

The official or public data for generation and recycling capacity of plastic waste material type focused by TTS PWRP in Kenya is not readily available, so independent market research is done by interviewing industrial experts to find the generation and recycling capacity of plastic waste for the material types focused by TTS, and the same is presented below. Survey report will be submitted to VVB in due course of the validation . The result of the analysis is provided below.

Penetration rate is found by using the below formula, as per the methodology, PWRM0002 V1.1

Penetration rate = C / G * 100

Penetration rate for the plastic type which are covered by TTS:

1.) PP other rigid = 180 / 5,400 * 100 = 3%

2.) PP films and flexibles = 480 / 78,000 * 100 = 2%

3.) PET thermoforms = 0 / 1,800 * 100 = 0%

4.) LDPE Films and Flexibles = 2,340 / 72,000 *100 = 3%

5.) HDPE Flexibles = 1,260 / 55,200 *100 = 2%

6.) PS = 0 / 4,800 * 100 = 0%

Step 3b: Project Method – Investment Analysis

The project is additional due to the penetration rate being below 20%. An investment analysis is also conducted in line with the Investment tool guideline and tool to calculate the additionality of the project. The return from the project is evaluated to understand the risk associated with the investment. It is found that the financial indicator (i.e., EIRR) is much below the benchmark and

it is not expected to cross the benchmark with the reasonable variation in the key parameters. The analysis sheet will be shared with the auditors during the validation of the project.

3.7 Methodology Deviations (3.15)

There are no methodology deviations.

4 ESTIMATED COLLECTED AND/OR RECYCLED PLASTIC WASTE

4.1 Baseline Collected and/or Recycled Plastic Waste

The baseline plastic waste collection is the amount of plastic waste that would have been collected in the absence of the project activity.

Recovery:

From PWRM0001, the baseline is calculated as:

$$B_{collected,d,y} = \sum_{i=1}^{n} B_{collected,i,d,y}$$

(Equation 2)

Where:

$B_{collected,\ d,\ y}$ = Total baseline plastic waste collection transferred to destination d in year y (tonnes), where d is an appropriate end destination

$B_{collected,\ i,\ d,\ y}$ = Amount of material type i collected in the absence of the project activity and transferred to destination d in year y (tonnes), where d is an appropriate end destination. Where material collected is not identified by type, this represents the total plastic waste collected in the absence of the project activity and transferred to destination d in year y (tonnes).

The baseline plastic waste collected was determined as follows:

Since it is a new activity in all collection sites, $B_{collected,\ d,\ y} = 0$

Recycling:

According to the PWRM0002, the Baseline for TakaTaka Solution will be calculated as:

$$B_{recycled,y} = \sum_{i=1}^{n} B_{p,recycled,i,y} \times AF_i + \sum_{i=1}^{n} B_{dp,recycled,i,y} \times MF$$

(Equation 2)

Where:

$B_{recycled,y}$ = Baseline amount of recycled plastic waste in year y (tonnes)

$B_{p,\ recycled,i,y}$ = Baseline amount of recycled plastic waste of material type i in year y (tonnes) without depolymerization

AFi = Adjustment factor for composite material i; for non-composite materials, this factor is equal to 1.

$B_{dp,recycled,i,y}$ = Baseline amount of recycled plastic waste in the form of depolymerized plastics from material type i in year y (tonnes). Since the material type can no longer be determined based on the output, it must be determined based on the input to the depolymerization process, using a mass balance approach.

MF = Mass fraction of the output of the depolymerization process used for plastic production

The baseline recycled plastic waste for material type i was determind as follows:

Since this is a new activity, the baseline is equal to 0 kg/year.

Hence, $B_{recycled,\ y} = 0$.

4.2 Project Collected and/or Recycled Plastic Waste

According to the PWRM0001, the project plastic waste collected is calculated as follows:

$$P_{collected,d,y} = \sum_{i=1}^{n} P_{collected,i,d,y}$$

(Equation 3)

Where:

$Pcollected,d,y$ = Total plastic waste collected by the project activity and transferred to destination d in year y (tonnes), where d is an appropriate end destination

$Pcollected,i,d,y$ = Amount of material type i collected by the project activity and transferred to destination d in year y (tonnes), where d is an appropriate end destination. Where material collected is not identified by type, this represents the total plastic waste collected by the project activity and transferred to destination d in year y (tonnes).

According to the PWRM0002, project plastic waste recycled is:

$$P_{recycled,y} = \sum_{i=1}^{n} P_{p,recycled,i,y} \times AF_i + \sum_{i=1}^{n} P_{dp,recycled,i,y} \times MF$$

(Equation 3)

Where:

$P_{recycled,y}$ = Total amount of plastic waste recycled by the project activity in year y (tonnes)

$P_{p,recycled,i,y}$ = Amount of plastic waste of material type i recycled by the project activity in the year y (tonnes) without depolymerization.

AFi = Adjustment factor for composite material i; for non-composite materials, this factor is equal to 1

$P_{dp,recycled,i,y}$ = Amount of plastic waste in the form of depolymerized plastics of material type i recycled by the project activity in year y (tonnes). Since the material type can no longer be determined based on the output, it must be determined based on the input to the depolymerization process, using a mass balance approach.

MF = Mass fraction of the output of the depolymerization process used for plastic production

NOTE on Adjustment Factor AFi: TakaTaka solution recycles and counts only non-composite materials as there is a pre-sorting process. This means that AFi = 1 for recycling activities.

4.3 Net Collected and/or Recycled Plastic Waste

The net plastic waste collected is the amount of plastic waste collected by the project activity that would not have been collected without project implementation.

Net plastic waste collection is calculated as follows from PWRM0001:

$$N_{collected,y} = \sum_{d=1}^{m} P_{collected,d,y} - B_{collected,d,y}$$

(Equation 4)

According to the PWRM0002, net recycled is:

$$N_{recycled,y} = P_{recycled,y} - B_{recycled,y}$$

(Equation 4)

Where: $Nrecycled,y$ = Net recycled plastic waste in year y (tonnes)

Since it is a new project, the baseline is 0, so the net collected and recycled plastic waste is the same as in Section 4.2.

Table 13a: The project plastic waste collection , Instance 1

Year	Estimated baseline collected plastic waste (tonnes)	PET Collected (Tonnes)	PP Collected (tonnes)	HDPE Collected (tonnes)	LDPE Collected (tonnes)	Total Estimated project net collected plastic waste (tonnes)
Year 1	0	357	863	131	135	1,586
Year 2	0	1082	2921	397	409	4,807
Year 3	0	1174	3171	431	444	5,220
Year 4	0	1298	3505	476	490	5,769
Year 5	0	2256	6091	827	852	10,027
Year 6	0	2503	6759	918	946	11,126
Year 7	0	2503	6759	918	946	11,126
Total	0	11,173	30,168	4,097	4,221	49,660

Table 13b: The project plastic waste recycling, Instance 1.

Year	Estimated baseline recycled plastic waste (tonnes)	PET Recycled (tonnes)	PP Recycled (tonnes)	HDPE Recycled (tonnes)	LDPE Recycled (tonnes)	Total Estimated project net recycled plastic waste (tonnes)
Year 1	0	223	602	82	84	991
Year 2	0	676	1825	248	255	3,005
Year 3	0	734	1982	269	277	3,262

Year 4	0	811	2190	297	306	3,606
Year 5	0	1410	3807	517	533	6,267
Year 6	0	1565	4225	574	591	6,954
Year 7	0	1565	4225	574	591	6,954
Total	0	6,983	18,856	2,561	2,638	31,037

Table 14a : The project plastic waste collection Instance 2

Year	Estimated baseline collected plastic waste (tonnes)	PET Collected (tonnes)	PP Collected (tonnes)	HDPE Collected (tonnes)	LDPE Collected (tonnes)	Total Estimated project net collected plastic waste (tonnes)
Year 1	0	977	2637	358	369	4,340
Year 2	0	1458	3937	535	551	6,480
Year 3	0	1583	4273	580	598	7,035
Year 4	0	1749	4723	641	661	7,776
Year 5	0	3041	8210	1115	1149	13,515
Total	0	8,808	23,780	3,229	3,327	39,145

Table 14b: The project plastic waste recycling, Instance 2

Year	Estimated baseline collected plastic waste (tonnes)	PET Recycled (tonnes)	PP Recycled (tonnes)	HDPE Recycled (tonnes)	LDPE Recycled (tonnes)	Total Estimated project net recycled plastic waste (tonnes)
Year 1	0	610	1648	224	231	2713
Year 2	0	911	2460	334	344	4050
Year 3	0	989	2671	363	374	4397
Year 4	0	1093	2952	401	413	4860
Year 5	0	1900	5131	697	718	8447
Total	0	5505	14,862	2018	2080	24,465

5 MONITORING

5.1 Data and Parameters Available at Validation (3.12)

Baseline plastic waste collection parameter (new activity):

Data / Parameter	$B_{collected,d,y}$
unit	tonnes/year
Description	Amount of plastic waste collected in the baseline and transferred to destination d in a year.
Equation	PWRM0001, version 1.1.: Equation 2
Value	0

Source of data	Measured or calculated on a dry basis, or external source(s) of data (e.g., primary surveys, third-party literature)
Justification of choice of data or description of measurement methods and procedures applied	Baseline plastic waste collection is zero for new project activities
Purpose	Determination of plastic waste collection for new activities
Comments	-

Baseline recycling parameter (new activity):

Data / Parameter	$B_{recycled,d,y}$
Data unit	tonnes/year
Description	Amount of material type i recycled in the baseline in year y
Equation	PWRM0002, Version 1.1: Equation 2
Value	N/A
Source of data	Based on historical data of recycled material type i or established in a reasonable and conservative manner
Justification of choice of data or description of measurement methods and procedures applied	Baseline plastic waste recycling is zero for new project activities
Purpose	Determination of baseline scenario
Comments	-

5.2 Data and Parameters Monitored (3.12)

For collection/recovery:

Data / Parameter	$P_{collected,d,y}$
Unit	tonnes/year
Description	Amount of plastic waste collected by the project activity and transferred to destination d in year y

Equation	PWRM0001, Version 1.1: Equation 3
Value	-
Source of data	Measurement on a dry basis at the collection site/facility and/or at the end destination
Description of measurement methods and procedures applied	Measurement of collected plastic waste is carried out using weighing machines, and the data is documented in the logbook, provided with the goods receipt.
Frequency of monitoring/recording	Recorded every time collected material is sent from the project site/facility to the appropriate end destination
Quality Assurance/Quality Control (QA/QC) procedures to be applied	Weighbridges are calibrated according to the equipment manufacturer's specifications or at least every three years.
Purpose	Calculation of project collected plastic waste
Comments	-

For recycling

Data / Parameter	Sorting output
Data unit	tonnes/year
Description	Quantity of sorted plastic waste of each material type i in year y.
Equation	-
Value	-
Source of data	On-site measurement (log books/records)
Description of measurement methods and procedures applied	Measurement of each material type i with weighing scales after sorting of waste and the data is documented in the logbooks
Frequency of monitoring/recording	Recorded at the time of sending each batch of sorted plastic waste from the sorting facility to the recycling facility
Quality Assurance/Quality Control (QA/QC) procedures to be applied	Weighbridges are calibrated according to the equipment manufacturer's specifications or at least every three years
Purpose	Calculation of project collected and/or recycled plastic waste

Comments	No hazardous materials are found during the sorting activity. The same can be confirmed during the site visit during the audit at the validation and verification stages.

Data / Parameter	Recycling input
Data unit	tonnes/year
Description	List of input materials (e.g., solvents, process fuels) to the recycling process. This includes the category of plastic waste of material type i and any other material(s) used in the recycling process in year y.
Equation	-
Value	-
Source of data	Material type and the quantity of plastic waste before entering the recycling facility is recorded in on-site records (log books/records). It can be used as a source of the recycling input.
Description of measurement methods and procedures applied	Weighing machines are used to weigh the plastic waste before sending as a recycling input and the data is recorded in the logbook.
Frequency of monitoring/recording	Recorded prior to each batch of sorted plastic waste entering the recycling process
Quality Assurance/Quality Control (QA/QC) procedures to be applied	Scales shall be calibrated according to the equipment manufacturer's specifications or at least once every three years. Hazardous material is not a part of the recycling activity. The same can be cross verified from the project reports and Quality control reports.
Purpose	Monitoring for compliance with Applicability Condition 5 in Section 4 of PWRP0002, v1.1
Comments	-

Data / Parameter	$P_{recycled,I,y}$
Unit	tonnes/year
Description	Amount of plastic waste of type i recycled by the project activity in year y (tonnes)
Equation	PWRM0002, Version 1.1: Equation 3

Value	-
Source of data	Direct measurement at project facility using weighing scales, the data is documented in the logbooks.
Description of measurement methods and procedures applied	Measurement of each material type i with weighing scale after the final stage at the recycling facility, before leaving the project site or being used for manufacturing products onsite
Frequency of monitoring/recording	Recorded prior to each batch of recycled plastic waste leaving the recycling facility.
Quality Assurance/Quality Control (QA/QC) procedures to be applied	Scales shall be calibrated according to the equipment manufacturer's specifications or at least every three years. The amount of plastic recycled shall be cross-checked with sales receipts of the material sold to the final buyer or another equivalent third-party evidence.
Purpose	Calculation of project recycled plastic waste
Comments	Only the dry weight of the plastic waste is noted. And only the material types for which recycling activities are determined to be additional at validation are included for crediting.

Data / Parameter	AFi
Unit	-
Description	Adjustment factor for composite material i
Equation	Equation 3
Value	Not applicable as the material used not contains composite materials.
Source of data	Default factors listed in Table 2 of the methodology PWRM0002, Version 1.1 that correspond to the composite materials recycled
Description of measurement methods and procedures applied	Apply the default factors listed in Table 2 of the methodology PWRM0002, Version 1.1 that correspond to the composite materials recycled.
Frequency of monitoring/recording	-.

Quality Assurance/Quality Control (QA/QC) procedures to be applied	-
Purpose	Calculation of project recycled plastic waste
Comments	-

For non-recycled plastic waste

Data / Parameter	End destination of non-recycled plastic waste
Unit	Unit tonnes/year
Description	End destination of plastic waste that enters the project recycling facility and is not recycled or is lost during the recycling process in year y (tonnes)
Equation	Collected plastic – Recycled Plastic = non-recycled plastic waste
Value	-
Source of data	Direct measurement at project facility/third-party evidence (e.g., receipts).
Description of measurement methods and procedures applied	Measured and calculated
Frequency of monitoring/recording	Total amount of non-recycled plastic waste will be reported annually.
Quality Assurance/Quality Control (QA/QC) procedures to be applied	N/A
Purpose	Monitoring of how much plastic waste collected could not be recycled and the end of life of the same is ensured.
Comments	-

5.3 Monitoring Plan (3.12.3 – 3.12.5)

1) The methods for measuring, recording, storing, aggregating, collating, and reporting data and parameters (including, where relevant, the procedures for calibrating monitoring equipment):

   All the collected and recycled volumes are monitored regularly by TTS representatives and the standard operating procedures are explained in Section 1.10.

2) The organizational structure, responsibilities, and competencies of the personnel that will be carrying out monitoring activities:

   Monitoring is done by trained project personnel, understanding the importance of accurate data collection. Frequent training ensures that all technicians have a similar approach to the gathering of the necessary data.

3) The policies for oversight and accountability of monitoring activities:

   Monitoring of areas, volumes collected and identity of collectors is done by trained project personnel, understanding the importance of accurate data collection. Frequent training ensures that all technicians have a similar approach to the gathering of the necessary data.

4) The procedures for internal auditing and QA/QC:

   All the collection sites employ a site administrator and quality control assistant. The collected volumes are monitored regularly and data are updated in the internal sheet.

5) The procedures for handling non-conformances with the validated monitoring plan:

   All the procedures described in the documents are already the results of recurrent corrections and adaptations of precedent procedures. More generally, the project has an adaptive approach, in which the project proponent and the local management team regularly document the lessons learned from previous experience and identify improvements to the project procedures.

   Non-conformances are recorded as separate events and excluded from the registry if the quantities collected are not within the boundaries of the TTS. In the case of repeated non-conformances, the TTS follows an adaptive approach where the event is handled by operational staff and recorded for annual review of the project methodology.

6) Any sampling approaches used, including target precision levels, sample sizes, sample site locations, stratification, frequency of measurement, and QA/QC procedures:

   QA/QC by trained representatives of TTS upon data collection and regular monitoring. Monitoring frequency several times per month each time upon collection.

6 IMPLEMENTATION STATUS

6.1 Implementation Status of the Project Activity

The project Instance 1, Pelletizer units 1 and 2 have been implemented and in operation since January 2022 and July 2022, respectively. However, Pelletizer 3 within Instance 1 is yet to be commissioned.

Instance 2 pelletizer units are planned to be commissioned in 2023 and 2024.

TTS representatives were in constant contact to monitor events. No events impacted waste collected and recycled.

6.1.1 Implementation Schedule

Future verifications are likely to be held in the same locations as this year.

7 QUANTIFICATION OF COLLECTED AND/OR RECYCLED PLASTIC WASTE

7.1 Data and Parameters Monitored

PWRP0001, V1.1, For collection:

Data / Parameter	$P_{collected,d,y}$
Data unit	tonnes/year
Description	Amount of plastic waste collected by the project activity and transferred to destination d in year y.
Equation	Equation 3
Value	Instance 1: 929
Source of data	Measurement on a dry basis at the collection site/facility and/or at the end destination log books/records
Description of measurement methods and procedures applied	Measurement of collected plastic waste is carried out using weighing machines, and the data is documented in the logbooks provided with the goods receipt.
Frequency of monitoring/recording	Recorded every time collected material is sent from the project site/facility to the appropriate end destination
Quality Assurance/Quality Control (QA/QC) procedures to be applied	Weighbridges are calibrated according to the equipment manufacturer's specifications or at least every three years
Purpose	Calculation of project collected and/or recycled plastic waste
Comments	-

PWRP0002, V1.1, For recycling:

Data / Parameter	Sorting output
Data unit	tonnes/year
Description	Quantity of sorted plastic waste of each material type i in year y.
Equation	-
Value	Instance 1: 928.87
Source of data	On-site measurement (log books/records)
Description of measurement methods and procedures applied	Measurement of each material type i with weighing scales after sorting of waste, and the data is documented in the logbook.
Frequency of monitoring/recording	Recorded at the time of sending each batch of sorted plastic waste from the sorting facility to the recycling facility.
Quality Assurance/Quality Control (QA/QC) procedures to be applied	Weighbridges are calibrated according to the equipment manufacturer's specifications or at least every three years.
Purpose	Calculation of project collected and/or recycled plastic waste
Comments	Where hazardous material is found during sorting, it must be eliminated and/or disposed of and removed from the process following relevant national, regional and local regulations

Data / Parameter	Recycling input
Data unit	tonnes/year
Description	List of input materials (e.g., solvents, process fuels) to the recycling process. This includes the category of plastic waste of material type i and any other material(s) used in the recycling process in year y.
Equation	-
Value	Instance 1: 721.84
Source of data	On-site records (log books/records)
Description of measurement methods and procedures applied	Weighing machines are used to weigh the plastic waste before sending as a recycling input and the data is recorded in the logbook.

Frequency of monitoring/recording	Recorded prior to each batch of sorted plastic waste entering the recycling process
Quality Assurance/Quality Control (QA/QC) procedures to be applied	Scales shall be calibrated according to the equipment manufacturer's specifications or at least once every three years. Hazardous material is not a part of the recycling activity. The same can be cross verified from the project reports and Quality control reports.
Purpose	Monitoring for compliance with Applicability Condition 5 in Section 4 of PWRP0002, v1.1
Comments	-

Data / Parameter	$P_{recycled,i,y}$
Data unit	tonnes/year
Description	Amount of plastic waste of type i recycled by the project activity in year y (tonnes)
Equation	Equation 3 (PWRP0002, v.1.1)
Value	Instance 1: 531.44
Source of data	Direct measurement at project facility using weighing scales, the data is documented in the logbooks.
Description of measurement methods and procedures applied	Measurement of each material type i with weighing scale after the final stage at the recycling facility, before leaving the project site or being used for manufacturing products onsite.
Frequency of monitoring/recording	Recorded prior to each batch of recycled plastic waste leaving the recycling facility.
Quality Assurance/Quality Control (QA/QC) procedures to be applied	Scales shall be calibrated according to the equipment manufacturer's specifications or at least every three years. The amount of plastic recycled shall be cross-checked with sales receipts of the material sold to the final buyer or another equivalent third-party evidence.
Purpose	Calculation of project recycled plastic waste
Comments	If plastic is washed, it should be weighed after it has been dried. Only material types for which recycling activities are determined to be additional at validation are included for crediting.

For non-recycled plastic waste

Data / Parameter	End destination of non-recycled plastic waste End destination of non-plastic waste from recycling facility
Data unit	tonnes/year
Description	End destination of plastic waste that enters the project recycling facility and is not recycled or is lost during the recycling process.
Equation	There is no equation involved in calculating losses, because the actual data includes the inventory stocks.
Value	Instance 1: Loss after detailed sorting = 181 Total loss after washing = 144 Total loss after pelletizing = 97 Total loss = 423
Source of data	Direct measurement at project facility
Description of measurement methods and procedures applied	N/A
Frequency of monitoring/recording	Yearly
Quality Assurance/Quality Control (QA/QC) procedures to be applied	N/A
Purpose	Monitoring for compliance with Applicability Condition 11 in Section 4
Comments	End destination and/or management of hazardous waste streams, where possible, may be disclosed using ISO 14001:2015 – Environmental management systems – Requirements with guidance for use or other relevant standards or certification schemes.

7.2 Monitoring Results

The monitoring was carried out according to the monitoring plan stated earlier in the document.

1) The methods for measuring, recording, storing, aggregating, collating, and reporting data and parameters (including, where relevant, the procedures for calibrating monitoring equipment):

All the collected and recycled material volumes are monitored regularly by TTS representatives. For traceability, the data are noted in delivery notes and internal sheets, which are validated by the site administrator and QC assistant.

2) The organizational structure, responsibilities, and competencies of the personnel that will be carrying out monitoring activities:

   Monitoring is done by trained project personnel, understanding the importance of accurate data collection. Frequent training ensures that all technicians have a similar approach to the gathering of the necessary data.

3) The policies for oversight and accountability of monitoring activities:

   Monitoring of areas, volumes collected and identity of collectors is done by trained project personnel, understanding the importance of accurate data collection. Frequent training ensures that all technicians have a similar approach to the gathering of the necessary data.

4) The procedures for internal auditing and QA/QC:

   All the collection sites employ a site administrator and quality control assistant. The collected volumes are monitored regularly, and data are updated in the internal sheet.

5) The procedures for handling non-conformances with the validated monitoring plan:

   All the procedures described in the documents are already the results of recurrent corrections and adaptations of precedent procedures. More generally, the project has an adaptive approach, in which the project proponent and the local management team regularly document the lessons learned from previous experience and identify improvements to the project procedures.

   Non-conformances are recorded as separate events and excluded from the registry if the quantities collected are not within the boundaries of the TakaTaka solution. In the case of repeated non-conformances, the TakaTaka solution follows an adaptive approach where the event is handled by operational staff and recorded for annual review of the project methodology.

6) Any sampling approaches used, including target precision levels, sample sizes, sample site locations, stratification, frequency of measurement, and QA/QC procedures:

   no sampling is undertaken to determine material type, since the project does not include composite materials

7.3 Baseline Collected and/or Recycled Plastic Waste

The baseline plastic waste collected was determined as follows, according to PWRM0001 and outlined in a previous section of the document:

As it is a new activity, the collection activities in all five sites have a baseline of 0.

$B_{collected,d,y}$ = 0,

The baseline plastic waste recycled was determined as follows, according to PWRM0002 and outlined in a previous section of the document:

$B_{recycled,i,y}$ = 0

7.4 Project Collected and/or Recycled Plastic Waste

According to PWRM0001, project plastic waste collected is:

$$P_{collected,d,y} = \sum_{i=1}^{n} P_{collected,i,d,y}$$

(Equation 3)

Where:

$Pcollected,d,y$ = Total plastic waste collected by the project activity and transferred to destination d in year y (tonnes), where d is an appropriate end destination

$Pcollected,i,d,y$ = Amount of material type i collected by the project activity and transferred to destination d in year y (tonnes), where d is an appropriate end destination. Where material collected is not identified by type, this represents the total plastic waste collected by the project activity and transferred to destination d in year y (tonnes).

According to PWRM0002, project plastic waste recycled is:

$$P_{recycled,y} = \sum_{i=1}^{n} P_{p,recycled,i,y} \times AF_i + \sum_{i=1}^{n} P_{dp,recycled,i,y} \times MF$$

(Equation 3)

Where:

$Precycled,y$ = Total amount of plastic waste recycled by the project activity in year y (tonnes)
$Pp,recycled,i,y$ = Amount of plastic waste of material type I recycled by the project activity in year y (tonnes) without depolymerization.

AFi = Adjustment factor for composite material I (see Adjustment factor under Section 8.1); for non-composite materials, this factor is equal to 1.

$Pdp,recycled,i,y$ = Amount of plastic waste in the form of depolymerized plastics of material type i recycled by the project activity in year y (tonnes). Since the material type can no longer be

determined based on the output, it must be determined based on the input to the depolymerization process, using a mass balance approach.

MF = Mass fraction of the output of the depolymerization process used for plastic production

NOTE: on Adjustment Factor AFi: TakaTaka solution recycles and counts only non-composite materials as there is a pre-sorting process. This means that AFi = 1 for recycling activities and the project has no depolymerization activity, so the parameter $Pdp,recycled,i,y$ is 0.

7.5 Net Collected and/or Recycled Plastic Waste

The net plastic waste collected is the amount of plastic waste collected by the project activity that would not have been collected without project implementation.

Net plastic waste collection is calculated as follows from PWRM0001:

$$N_{collected,y} = \sum_{d=1}^{m} P_{collected,d,y} - B_{collected,d,y}$$

(Equation 4)

Where: $Ncollected,y$ = Net plastic waste collected in year y (tonnes)

According to PWRM0002, net recycled is:

$$N_{recycled,y} = P_{recycled,y} - B_{recycled,y}$$

(Equation 4)

Where: $Ncollected,y$ = Net plastic waste collected in year y (tonnes)

Table 15: Actual recorded values for plastic collected in 2022 according to plastic sorting reports (Tonne)

Type of plastic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total
Polyethylene terephthalate (PETE or PET)	26	29	44	33	38	29	8	17	224
Polypropylene (PP)	53	64	92	69	76	60	17	40	472
Polystyrene (PS) or expanded polystyrene (EPS)									0

Other plastics (O)									0
High-density polyethylene (HDPE)	4	13	14	11	7	8	2	12	72
Low-density polyethylene (LDPE)	1	22	16	18	16	24	24	42	161
Polyvinyl chloride (PVC)									0
Total	**85**	**129**	**166**	**131**	**136**	**121**	**50**	**110**	**929**

Table 16 Plastic waste recycled in 2022 by input material according to Pelletizer report/Recycling Report (Tonne)

Type of plastic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total
Polyethylene terephthalate (PETE or PET)	0	19	25	21	10	41	36	15	168
Polypropylene (PP)	24	68	88	69	43	40	17	37	385
Polystyrene (PS) or expanded polystyrene (EPS)	0	0	0	0	0	0	0	0	0
Other plastics (O)	0	0	0	0	0	0	0	0	0
High-density polyethylene (HDPE)	0	0	10	6	9	30	5	7	67
Low-density polyethylene (LDPE)	0	0	0	0	32	9	6	56	103
Polyvinyl chloride (PVC)	0	0	0	0	0	0	0	0	0
Total	**24**	**87**	**122**	**96**	**94**	**119**	**64**	**115**	**722**

Table 17: Plastic waste recycled by output material in 2022 according to the Pelletizer Report/Recycling Report (Tonne)

Type of plastic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total
Pellets (every fraction except PET thermoformed)	0	44	92	85	63	27	54	33	397
PET thermoformed flakes	0	15	20	17	8	33	29	12	134

Table 18: Non-recycled plastic waste (Tonne)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total
Loss after detailed sorting	18	24	39	12	27	32	14	15	181
Total loss after washing	14	16	8	6	15	36	9	42	144
Total loss after pelletizing	0	12	6	4	11	27	7	32	97

8 APPENDICES

8.1 Appendix 1: Attached are pictures for the proof of project ownership – Lease agreement (sample)

⇨ Documents will be submitted in due course of validation.

8.2 Appendix 2: Attached are pictures for the proof of collection activity



Figure 11: Waste purchase photo from waste pickers at buyback center

8.3 Appendix 3: Attached are pictures for the proof of recycling activity

⇨ Documents will be submitted in due course of validation.

8.4 Appendix 4: Attached are pictures for proof of sale of recycled material (Flakes and Pellets)



Figure 12: Recycled plastics, having been sold to the manufacturer, are loaded on the truck