Plastic Waste Collection Methodology

Version 0.1

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CONTENTS

1 SOURCES

This methodology references certain procedures set out in the following methodologies and tools:

- VCS Methodology: *VM0018, Version 1.0, Energy Efficiency and Solid Waste Diversion Activities within a Sustainable Community*
- CDM methodology: AMS-III.A.J. *Recovery and recycling of materials from solid wastes, Version 7.0*
- CDM methodology: AMS-III.B.A. *Recovery and recycling of materials from E-waste, Version 2.0*
- CDM tool: Tool 01 *Tool for the demonstration and assessment of additionality, Version 7.0*
- CDM tool: Tool 19 *Demonstration of additionality of microscale project activities, Version 9.0*
- CDM tool: Tool 10 *Tool to determine the remaining lifetime of equipment, Version 1*
- CDM tool: Tool 24 *Methodological Tool, Common Practice, Version 3.1*
- CDM concept note: *Consistent use of market share, market saturation, market penetration and penetration rate, Version 1.0*
- CDM large scale consolidated methodology: ACM0022 *Alternative waste treatment processes, Version 2.0*
- CDM large scale consolidated methodology: ACM0003 *Partial substitution of fossil fuels in cement or quicklime manufacture, Version 8.0*

The following have also informed the development of this methodology:

- Ellen MacArthur Foundation, CE 100: Enabling A Circular Economy For Chemicals With The Mass Balance Approach – A White Paper From Co-Project Mass Balance
- Ocean Conservancy and McKinsey Center for Business and Environment: Stemming the Tide: Land-based strategies for a plastic-free ocean
- ISO 15270:2008 (en) - Plastics - Guidelines for the recovery and recycling of plastics waste
- *VCS Guidance for Standardized Methods*, v3.3

2 SUMMARY DESCRIPTION OF THE METHODOLOGY

Additionality and Crediting Method	
Additionality	Activity and project method
Crediting Baseline	Project method

This methodology provides procedures to estimate the net plastic waste[1] removed or diverted from the environment through informal and formal activities with the objective of preventing plastic waste from remaining in or ending up in the environment.

Projects that involve both collection and recycling of plastic waste shall apply this methodology in conjunction with the *Plastic Waste Recycling Methodology* to demonstrate additionality and quantify the plastic waste collected and recycled by the respective activities.

Sections that are not applicable to projects using the *Plastic Standard* only to account for the results of their collection activities and not to issue Waste Collection Credits are marked as such[2].

3 DEFINITIONS

In addition to the definitions set out in the Plastic Waste Reduction Program (Plastic Program) document *Plastic Program Definitions*, the following definitions apply to this methodology:

- **Appropriate end destination:** Eligible end-of-life option under the methodology. Please see Section 4.1(7) for a list of appropriate end destinations.
- **Capacity addition:** An investment to increase the capacity of an existing collection activity through the addition, replacement or modification of the equipment, infrastructure and/or process
- **Extended producer responsibility (EPR):** A policy approach under which producers are given a significant financial and/or physical responsibility for the treatment or disposal of post-consumer products (OECD)
- **Formal waste sector activities (formal sector or formal activities)[3]:** Waste management activities planned, sponsored, financed, carried out or regulated and/or recognized by the local authorities or their agents, usually through contracts, licenses or concessions

[1] In this document, the term plastic waste refers to all waste that includes materials under the scope of the Plastic Program, including composite materials (e.g., used beverage cartons).
[2] In this *Plastic Waste Collection Methodology* v0.1, this is Section 7.
[3] Adopted from CDM. AMS-III.A.J. *Recovery and recycling of materials from solid wastes, Version 7.0.* Available at: https://cdm.unfccc.int/methodologies/DB/R22750M155F84YR0D4YVYOS0CLSCII

- **Gasification[4]:** The process of thermal decomposition of organic compounds at high temperatures, typically more than 800˚C. Gasification converts organic compounds, of both biogenic and fossil origin, into combustible gas (e.g., syngas) which can be used for electric power generation or converted into fuel or chemical feedstocks, such as ethanol and methanol, some of which can also be used to make new plastics that go into consumer products.

- **Incineration[5]:** The controlled combustion of organic compounds of both biogenic and fossil origin with or without heat capture and utilization, where the process meets applicable and proposed emission limits and other environmental regulatory constraints. Ideally, all the organic content is converted into CO_2 and H_2O. Practically, as combustion is incomplete and as inert matter is also in the combusted waste, ashes are also an important by-product.

- **Informal waste sector activities (informal sector or informal activities)[6]:** Individuals or a group of individuals who are involved in waste management activities, but are not formally registered or formally responsible for providing waste management services. Newly established formalized organizations of such individuals; for example, cooperatives, social enterprises and programs led by non-governmental organizations (NGOs), can also be considered as the informal sector for the purpose of this methodology.

- **Managed landfill:** A waste disposal site for the deposit of waste onto or into land under controlled or regulated conditions (ISO 15270:2008 (en) - Plastics - Guidelines for the recovery and recycling of plastics waste). Waste that is disposed of at the managed landfill is unlikely to leak into the environment over time. The landfill shall:
    - Be government recognized or affiliated;
    - Have restrictions on access to avoid waste scavenging;
    - Have a well-defined boundary;
    - Include at least one of the following: cover material; mechanical compacting, or leveling of the waste (IPCC, 2019);
    - Have daily cover application (with soil or other material) to remove plastic waste from the influence of the outside environment;
    - Have a leachate drainage system (IPCC, 2019) or other reasonable measures to avoid soil and water contamination;

[4] Adopted from CDM, Large Scale Consolidated Methodology. ACM0022. *Alternative waste treatment processes, Version 2.0.* Available at: https://cdm.unfccc.int/methodologies/DB/YINQ0W7SUYOO2S6GU8E5DYVP2ZC2N3
[5] Adopted from CDM. Large Scale Consolidated Methodology, ACM0022. *Alternative waste treatment processes, Version 2.0.* Available at https://cdm.unfccc.int/methodologies/DB/YINQ0W7SUYOO2S6GU8E5DYVP2ZC2N3 including an addition from National Research Council (US) Committee on Health Effects of Waste Incineration (2000). *Waste Incineration & Public Health.* Available at: https://www.ncbi.nlm.nih.gov/books/NBK233627/.
[6]Adopted from CDM. AMS-III.A.J. *Recovery and recycling of materials from solid wastes, Version 7.0.* Available at: https://cdm.unfccc.int/methodologies/DB/R22750M155F84YR0D4YVYOS0CLSCII

- Include sanitary lining or other reasonable measures to avoid waste being placed directly on the ground;
- Be capped when it closes;
- Control placement of waste (i.e., to specific areas in the landfill) (IPCC, 2019); and
- Have measures to avoid fires (i.e., to avoid open burning) (IPCC, 2019).

Note to Reviewers: The definition of managed landfill has been developed using established definitions, while being sensitive to the variation in local conditions that affect the quality of accessible landfills, to avoid excluding projects that collect plastic in more remote areas.

1. Question for consideration: Is the definition of managed landfill appropriate? Should projects have to meet all of the above requirements, or are there top requirements that should be included in a subset of priority requirements?

- **Market penetration[7]:** The percentage of total market value that the technology captures out of the total market size for that technology over a defined period of time
- **Market share[8]:** The percentage of total market value that the technology captures out of the total market size
- **Material Recovery Facility (MRF)[9]:** A plant that separates and prepares single-stream recycling materials to be sold to end buyers
- **Municipal solid waste (MSW)[10]:** A heterogeneous mix of different solid waste types, usually collected by municipalities or other local authorities. MSW includes household waste, garden/park waste and commercial/institutional waste.
- **Open burning of waste[11]:** Uncontrolled waste combustion practices, including dump fires, pit burning, fires on plain soil and barrel burning. Open burning is characterized by burning at low temperatures (between 250°C and 700°C) and in oxygen-deprived environments leading to incomplete combustion of waste. It also refers to burning conducted in such a manner that combustion air is not effectively controlled and combustion products are not

[7] CDM. Concept Note. *Consistent use of market share, market saturation, market penetration and penetration rate, Version 1.0.* Available at: https://cdm.unfccc.int/Panels/meth/index.html
[8] CDM. Concept Note. *Consistent use of market share, market saturation, market penetration and penetration rate, Version 1.0.* Available at: https://cdm.unfccc.int/Panels/meth/index.html
[9] Rubicon (2019). *What is a Materials Recovery Facility (MRF).* Available at: https://www.rubicon.com/blog/materials-recovery-facility/
[10] Adopted from CDM, Large Scale Consolidated Methodology. ACM0022. *Alternative waste treatment processes, Version 2.0*. Available at: https://cdm.unfccc.int/methodologies/DB/YINQ0W7SUYOO2S6GU8E5DYVP2ZC2N3
[11] R20 - Regions of Climate Action (2019). *Open Burning of Waste: A Global Health Disaster*. Available at: https://regions20.org/wp-content/uploads/2016/08/OPEN-BURNING-OF-WASTE-A-GLOBAL-HEALTH-DISASTER_R20-Research-Paper_Final_29.05.2017.pdf

vented through a stack or chimney. The following burning practices are included in this definition:

- Residential open burning: Occurs primarily due to its convenience and insufficient collection systems. Domestic open burning is the indiscriminate burning of waste by individuals that is never collected or is collected and dumped away from dumpsites. This can occur just outside the home or in places where waste is illegally dumped such as roadsides or other open public spaces.
- Deliberate open burning in landfills and open dumpsites: Waste in landfills and open dumpsites is often burned to reduce the quantity when these sites are filled beyond their capacity or have an unknown, and likely insufficient, capacity due to the lack of planning involved in the establishment of open dumps.
- Spontaneous open burning in landfills and open dumpsites: Fires can occur spontaneously and unintentionally within open dumps and landfills in large piles of trash. These fires are likely caused by the lack of waste treatment, apart from burning, that occurs in these disposal areas.

- **Producer:** Entities engaged in manufacture or import of packaging products made of or including plastic, including industries or individuals using products made of or including plastic for packaging or wrapping a commodity

- **Pyrolysis:** The decomposition of plastic from waste into synthetic crude oils that can be refined into diesel fuel, gasoline, heating oil or waxes, or the processing of the waste back to feedstock by breaking polymer chains down to hydrocarbon fractions

- **Refuse-derived fuel (RDF)[12]:** A fuel which is derived from the mechanical and/or thermal treatment of waste and which is used in an incineration or co-incineration process. RDF is produced by shredding and dehydrating solid waste with a waste converter technology.

- **Region:** The spatial boundary covering at least the geographical area containing the raw material sources and the product markets for the project proponent, and at most the maximum region surrounding the project facility having similar technological, economic, environmental and regulatory circumstances. By default, the region is the entire host country (generally applicable for smaller countries). If the project proponent limits the applicable geographical area to a specific geographical area (e.g., province, state) within the host country (generally applicable for larger countries), then it shall provide justification on the essential distinction between the identified specific geographical area and rest of the host country, based on the aforesaid criteria.

[12] Adopted from CDM, Large Scale Consolidated Methodology. ACM0022. *Alternative waste treatment processes, Version 2.0.* Available at: https://cdm.unfccc.int/methodologies/DB/YINQ0W7SUYOO2S6GU8E5DYVP2ZC2N3

- **Total market size[13]:** The expected total market value for a technology and is equal to the total population, households, end consumers or capacity in the relevant geographic region under study

- **Unmanaged Landfill:** A waste disposal site that does not comply with the definition of 'managed landfill'

- **Waste Disposal:** The deposit of waste to land or water for an indefinite period

- **Waste Management[14]:** All types of waste management operations shall refer to the definition in the "Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal" in Article 2 and referred to in Annex IV. This United Nations international convention respects the full right of countries to define their waste management operations (Article 2).

- **Waste Processing (Processing)[15]:** Conversion of sorted materials into secondary materials for substitution of virgin materials (in the case of mechanical recycling) or other end applications (e.g., co-processing) as deemed suitable. The process can include manual, mechanical and electro-chemical processes and technologies.

- **Waste Sorting[16]:** The separation of collected waste into different categories of recyclable (and non-recyclable) materials to facilitate further processing (or other relevant action as applicable). The sorting process may include manual sorting and segregation and/or further separation through physical, mechanical and electromagnetic processes.

4 APPLICABILITY CONDITIONS

4.1 This methodology is applicable under the following conditions:

4.1.1 Project activities that result in plastic waste collection from the environment through informal and formal collection activities as described below:

[13] CDM. Concept Note. *Consistent use of market share, market saturation, market penetration and penetration rate, Version 1.0.* Available at: https://cdm.unfccc.int/Panels/meth/index.html
[14] Adopted from VCS Methodology (n.d.). VM0018. *Energy Efficiency and Solid Waste Diversion Activities within a Sustainable Community Version 1.0.* Available at: https://verra.org/methodology/vm0018-energy-efficiency-and-solid-waste-diversion-activities-within-a-sustainable-community-v1-0/
[15] Adopted from CDM. AMS-III.B.A. *Recovery and recycling of materials from E-waste, Version 2.0.* Available at: https://cdm.unfccc.int/methodologies/DB/PVHQ5T7VGCTO07EUHFU517J4HNW21Q
[16] Adopted from CDM. AMS-III.B.A. *Recovery and recycling of materials from E-waste, Version 2.0.* Available at: https://cdm.unfccc.int/methodologies/DB/PVHQ5T7VGCTO07EUHFU517J4HNW21Q

1) Informal collection: Collection of plastic waste by the informal sector for plastic waste management such as recycling, reuse, repurpose or disposal in a managed landfill.

2) Formal collection: Collection of plastic waste streams under the ownership and oversight of the formal sector for recycling or other waste management purposes. There may be participation of the informal sector in some activities of the value chain, but the ownership and management of the project activity will lie with the relevant local authority(ies) (e.g., government, quasi-government[17]).

Plastic waste collection activities may include sub-activities such as sorting, shredding, decontamination or melting prior to transferring the waste material to the next relevant entity in the value chain.

Please refer to Appendix I for examples of project activities that could be eligible under this methodology.

4.1.2 The collection activity is a new activity or a capacity addition activity resulting in an increase in the total capacity for collection. The collection process may be accomplished manually or by simple and/or sophisticated electro-mechanical equipment.

4.1.3 The sources of the collected waste shall be clearly identifiable and certified to be an existing or potential source of the plastic waste that would have been left in the environment (including open burning, dumping), incinerated without energy recovery or disposed of in an unmanaged landfill in the absence of the project activity. This can be certified by a local authority or demonstrated by using official government data, third party independent surveys and research, academic research/papers or independent market research.

4.1.4 The collected waste is disposed of directly in a managed landfill, or transferred directly (with or without commercial transactions) to a processing/recycling/manufacturing facility or to a chain of intermediary agencies that transfer the material to the appropriate end destination (e.g., identifiable processing/manufacturing facilities and/or managed landfills).

4.1.5 The dry weight of the final output of the collected plastic waste that reaches an appropriate end destination shall be directly measured and recorded. If it is not possible to directly measure the output, measurement records may be obtained from the end destination (i.e., the purchasing or receiving entity of the collected waste). Audited documents such as sales invoices generated by the project proponent or goods receipt notes generated by the

[17] A quasi-government organization is an entity in the private sector that is supported by the government with a public mandate to provide a given service. Examples include public corporations like telephone companies and water utilities.

recipient are acceptable records for accounting purposes.

4.1.6 The output of the collection activity shall not end up in any unauthorized, illegal or non-statutory activities within the value chain (e.g., the manufacturing of products that do not conform to the quality criteria set by the relevant statutory/regulatory bodies, including the manufacturing of unauthorized products in a planned manner or as exceptions/rejects in the production line). This can be achieved by monitoring the output of the collection activity and ensuring that it goes through authorized or licensed entities throughout the value chain. Contractual documents between the project proponent and the recipient(s) of the collected waste are sufficient to demonstrate the same.

4.1.7 The project activity does not divert plastic waste from an existing collection or recycling activity with an end application or destination that is more environmentally beneficial (e.g., lower emissions of greenhouse gases, particulate matter or other harmful gases).

Material collected in the project activity shall be managed using one or more of the end-of-life options listed below. These options are referred to as appropriate end destinations throughout this methodology and are listed in descending order of preference in terms of their relative environmental benefit. Project proponents shall demonstrate that the end-of-life option used in the project activity is more environmentally beneficial than what would have occurred without the implementation of the project activity. Note that the order of preference and relative environmental benefit of the options listed below may vary based on the technological, geographic or regulatory context of the project.

- **Reuse:** May include using the collected plastic waste in, among others, construction materials (e.g., pavement tiles, plastic bricks), road construction, or other commodities (e.g., decorative craftwork, toys, household items) with commercial value.
- **Mechanical recycling:** Includes both open and closed loop recycling, where the collected waste is reprocessed into a product, a component incorporated into a product or a secondary raw material.
- **Incineration with energy recovery - co-processing:** Use of plastic waste, including as RDF, as a raw material and/or source of energy to replace natural mineral resources (material recycling) and fossil fuels (energy recovery) in industrial processes (primarily energy intensive industries such as cement and power generation).
- **Incineration with energy recovery - gasification or pyrolysis:**
    - Direct chemical conversion of the collected plastic waste to fuel (solid, liquid or gaseous fuel) may entail processing the plastic alone or in combination with other materials such as paper or wood. The chemical transformation may involve conversion to products that are used as feedstock in relevant industries.
    - The energy recovery facility shall demonstrate successful end use of the recovered energy (i.e., for domestic and/or commercial use by self or other parties).

- Compliance of the activities of the facility with local or national regulations shall be demonstrated. In the absence of such regulations, compliance with relevant international regulations, best practices recommended by internally recognized bodies, industry associations or sector specific associations shall be demonstrated.

- **Managed landfill**: Please refer to the definition in Section 3 for details on this end-of-life option.
- **Incineration without energy recovery:** In some regions, incineration of plastic waste without energy recovery is permitted by local regulations due to space constraints, economic difficulties or insufficient reasonably accessible technology. This end-of-life option shall only be used under such circumstances.

4.2 This methodology is not applicable under the following conditions:

4.2.1 Project activities that include the following end-of-life management of plastic waste: open burning, dumping in open land and/or water bodies, incineration without energy recovery unless required or allowed by local regulations as stated in Section 4.1, or disposal in an unmanaged landfill.

4.2.2 Transboundary movement of collected plastic waste between countries, except in the following circumstances:

1) Projects involving collection of plastic waste in Least Developed Countries (LDC)[18] or Small Island Developing States (SIDS)[19] and exporting to other countries (LDCs, SIDS or otherwise) for further processing to ensure greater environmental benefit, where a robust and transparent audit trail ensuring compliance of the intended appropriate end destination can be demonstrated.

2) Projects involving import of plastic waste from other countries where the appropriate quality and quantity of the material type is not available in the importing country. Project proponents shall demonstrate the same through primary surveys or secondary literature available in the public domain and/or certified by a competent authority[20].

> **Note to Reviewers:** The objective of this applicability condition is to discourage the export of waste from developed and developing nations (except LDCs and SIDS) and to encourage development of local waste management infrastructure and practices.

[18] United Nations Conference on Trade and Development (n.d.). *UN list of Least Developed Countries.* Available at: https://unctad.org/en/Pages/ALDC/Least%20Developed%20Countries/UN-list-of-Least-Developed-Countries.aspx

[19] United Nations (n.d.). List of SIDS. Available at: https://www.un.org/ohrlls/content/list-sids

[20] A competent authority is an entity that has been authorized by the concerned regulatory body, overseeing local or national government body/department/ministry or an internationally recognized organization to execute and/or certify the task in question. The same is subject to verification by the project auditor.

2. Questions for Consideration:

a) Is this approach of excluding transboundary movement of plastic waste, unless it entails the collection of plastic waste in LDCs or SIDS and export to other countries (LDC, SIDS or otherwise) for further processing, appropriate?

b) Should the import of materials be limited to semi-processed waste when the material type is not available in the importing country?

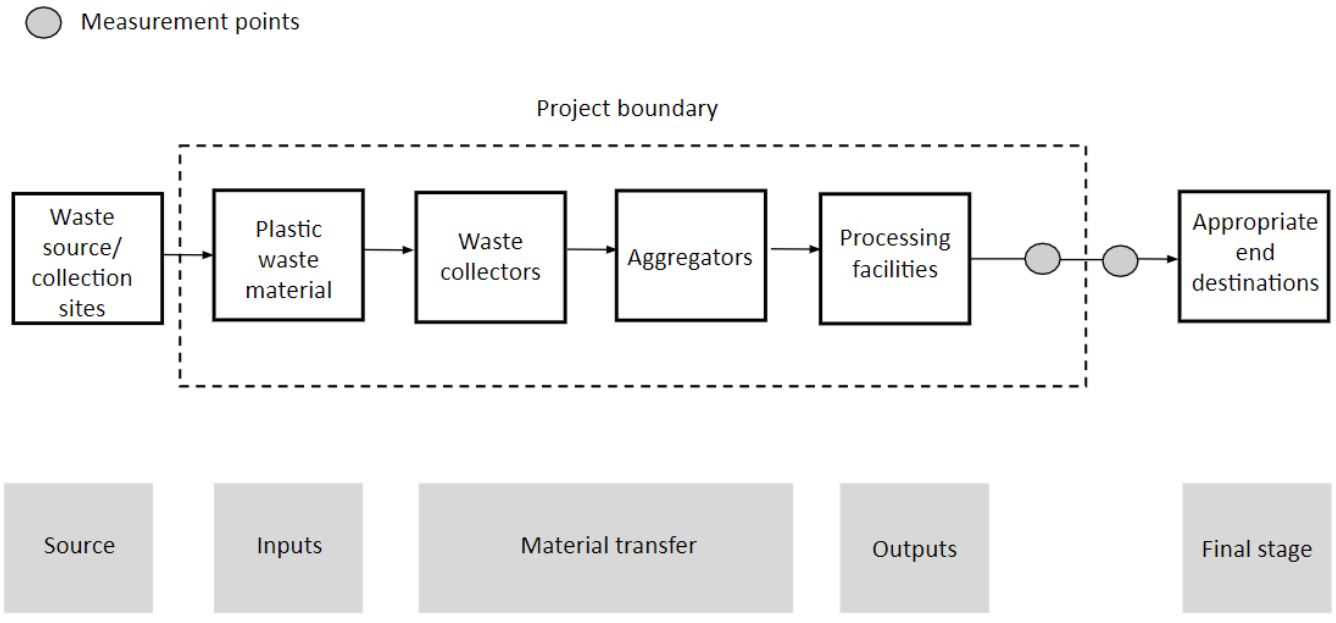
5 PROJECT BOUNDARY

The spatial extent of the project boundary encompasses:

- Waste source/collection sites (e.g., households, commercial establishments, landfills, streets);
- Waste collectors;
- Aggregators;
- Processing facilities (e.g., material recovery facility (MRF)); and
- Appropriate end destinations (see Section 4.1) of the collected plastic waste.

If feasible, the material type of the waste being collected in the project activity shall be included in the project boundary section of the project description.

Figure 1: Spatial boundary of the project activity



6 BASELINE SCENARIO

The baseline scenario shall be categorized into one or more of the following activities where plastic waste is:

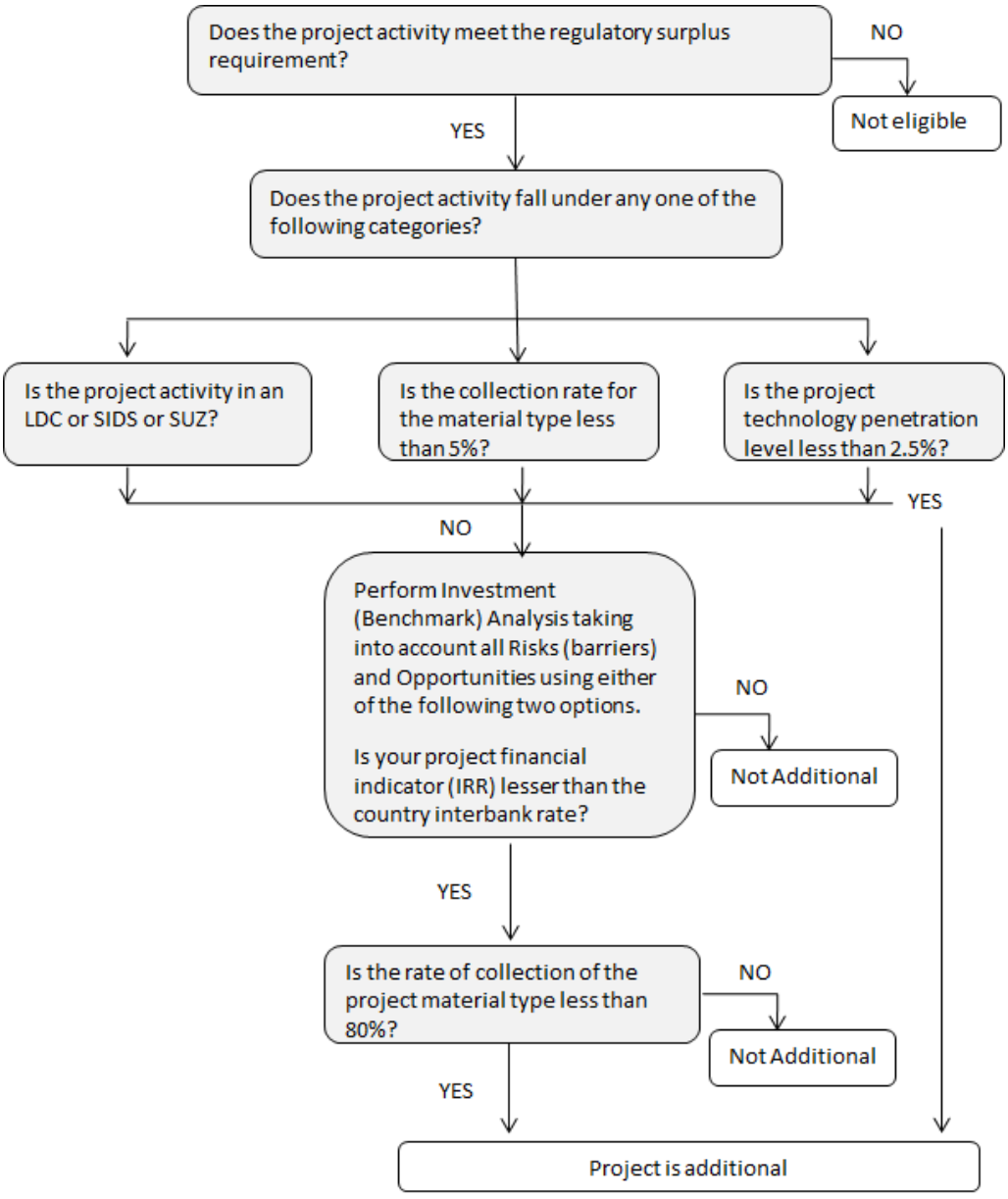
1) Open burned;
2) Dumped in unmanaged landfills/dumping sites;
3) Dumped in the environment (e.g., land, water bodies);
4) Collected for:
    a) Disposal in a managed landfill;
    b) Mechanical recycling;
    c) Incineration with energy recovery/chemical conversion (e.g., gasification, pyrolysis);
    d) Co-processing as alternative fuel and/or raw material;
    e) Incineration without energy recovery;
    f) Repurpose (e.g., utilization as construction material); or
5) The project activity is undertaken without being registered under the Plastic Program.

7 DEMONSTRATION OF ADDITIONALITY

Project activities shall apply the stepwise approach to demonstrate additionality as shown in Figure 2 and in accordance with the guidance in this section.

Note – The requirements in this section do not apply to projects that intend to use the Plastic Standard *solely for accounting purposes and not to issue Waste Recycling Credits.*

Figure 2: Demonstration of additionality



7.1 Regulatory Surplus

The project proponent shall demonstrate that the project activity proactively exceeds the current regulations or the regulatory compliance scenario and initiates a new collection activity, or expands an existing one, without being registered as a project activity under the Plastic Program. The project proponent shall determine whether the applicable laws and regulations are enforced and determine the compliance rate for those that are. The project proponent may demonstrate widespread non-compliance in the project region by showing that the existing compliance rate is less than 50 percent, and thus the project activity meets the regulatory surplus requirement.

Compliance with a law or regulation in a given region shall be measured by the total number of relevant entities in the region complying with the law or regulation divided by the total number of relevant entities in the region to whom the law or regulation applies. For example, in the formal sector, if two out of 20 municipal bodies in a state are in compliance with an applicable waste collection regulation, then the compliance rate is 10 percent. The compliance rate may be determined based on primary surveys or from secondary literature published and/or certified by a competent authority.

The assessment shall include a list of all EPR and related voluntary schemes relevant to the project activity in the applicable region. The existence of relevant EPR and related voluntary schemes shall not be used to indicate an existing legal requirement for the project activity unless the specific EPR scheme is required by law.

3. Question for Consideration: We note that there are many EPR schemes emerging globally around plastic consumption, collection and recycling. Should EPR schemes be included as part of the regulatory surplus assessment? If so, is the guidance provided sufficient to avoid confusion of how EPR schemes should be treated when undertaking the regulatory surplus assessment?

7.2 Activity Method

Projects applying the activity method shall follow the step-wise approach below to demonstrate additionality.

7.2.1 Positive list: Plastic collection activities will be deemed automatically additional if they fulfill any one of the following conditions. Within a region with similar technological, economic, regulatory and environmental conditions:

1) The project is located in a LDC, SIDS and/or in a Special Underdeveloped Zone (SUZ). As defined in the CDM tool: Tool 19. *Demonstration of additionality of microscale project activities, Version 9.0*, a SUZ is a region in the project country identified by the government in official notifications for development assistance, including for planning, management and investment, satisfying any one of the following conditions using the most recent data available:

   a) The proportion of population with income (i.e., purchasing power parity) less than USD 2 per day in the region is greater than 50 percent;

   b) The gross national income (GNI) per capita in the country is less than USD 3,000 and the population of the region is among the poorest 20 percent in the poverty ranking of the host country as per the applicable national policies and procedures; or

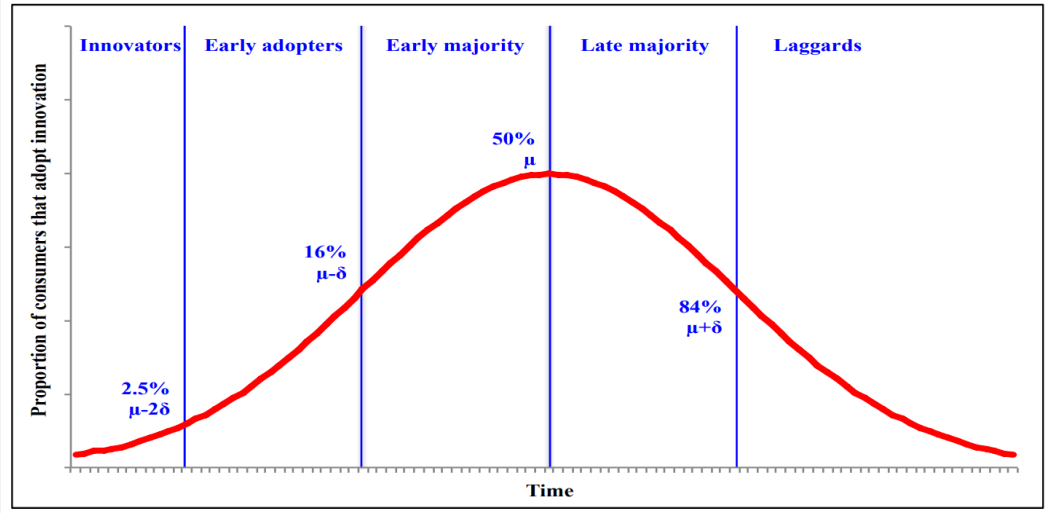
c) The proportion of the population in the region with income less than the national poverty line used by the host country for reporting on the UN Sustainable Development Goals (SDGs) is greater than 50 percent.

2) The primary technology(ies) used by the project proponent in the collection activity does not have more than 2.5 percent penetration in the region. The penetration rate shall be calculated by determining the ratio between actual technology adoption and the maximum adoption potential of the technology; or

3) No more than five percent of each material type being collected in the project activity is collected in the region. This shall be calculated by determining the ratio between the annual rate of collection of the material type in the region and the annual generation of the material type in the region.

Note to Reviewers:

a. It is found from Roger's diffusion model (2003, Everett Rogers, The Diffusion of Innovations[21]) that for a given technology in a given market, as is shown in the following illustration, the category of adopters are considered as "innovators" when technology penetration is less than or equal to 2.5% (first of its kind), as "early adopters" and "early majority" when the penetration is in the next 13.5% and 34%, respectively (need to demonstrate additionality), as "late majority" for the next 34% (common practice) and as "laggards" for the next 16% (saturation).



b. According to the figure above, once a technology has gained a 50% penetration level it will begin to overcome market barriers and become a prevailing practice in the market. However, this may not be applicable to all sectors. For example, the waste

[21] CDM. Concept Note. *Consistent use of market share, market saturation, market penetration and penetration rate, Version 01.0.*

collection rate in low and middle income countries[22] is 50 – 80%, yet collected waste is not sent to appropriate end destinations due to issues such as the lack of segregation at source and the capital intensive nature of waste management.

c. The percentages for market penetration/market share have been established based on research documented in the CDM Concept Note on "Consistent use of market share, market saturation, market penetration and penetration rate". The numbers currently pertain to the general adoption of a new technology but may be customized for the plastic waste sector based on further research. The determination of these values is aligned with the guidelines provided in Verra's *VCS Methodology Requirements, v4.0* and Verra's *VCS Guidance for Standardized Methods, v3.3*.

d. We consulted with stakeholders in our network and learned that there will be no additional costs or difficulties for project proponents to collect and analyze information for the calculation of the market penetration rate, since this value may be obtained as part of the general project assessment process.

4. Questions for Consideration:

a) Are the proposed thresholds under the positive list appropriate?

b) Is it reasonable to assume that the technology penetration and collection rate can be calculated easily by project developers as a part of their general market/feasibility assessment or will this be an additional cost?

7.3 Project Method

For projects that do not qualify for the positive list, the project proponent shall follow the step-wise approach below to demonstrate additionality.

7.3.1 The project proponent shall demonstrate that technologies/practices that provide outputs/services of comparable qualities, properties and application areas as the proposed project activity, are not incentivized and are not introduced to the market. This shall include demonstrating that existing collection facilities do not have the economies of scale necessary to develop and operate at the necessary levels to achieve affordable gains similar to the goals of the registered project activity.

7.3.2 Investment Analysis: The project proponent shall carry out an investment analysis using the benchmark analysis option prescribed in the CDM tool: Tool 01. Tool for the demonstration and assessment of additionality, Version 07.0, taking into account all barriers (risks), opportunities, costs and revenues associated with the project activity.

[22] World Bank (2019). *Classifying Countries by Income.* Available at: http://datatopics.worldbank.org/world-development-indicators/stories/the-classification-of-countries-by-income.html

Examples of barriers include technological, investment and institutional barriers.

The project proponent shall conduct a sensitivity analysis of ±10 percent of key parameters and assumptions made in the investment analysis. At a minimum, the sensitivity analysis shall test for financial feasibility due to changes in the inflation rate, discount rate, upfront capital cost and annual operating costs.

Note to Reviewers: Based on prevailing controversy and confusion in regard to the highly subjective nature of barriers under the "Barrier Analysis" route for demonstration of additionality (as prescribed in the CDM tool: Tool 01. *Tool for the demonstration and assessment of additionality, Version 07.0,* for large scale CDM projects and PoAs), we suggest the use of only the "Benchmark Analysis" route under the Investment Analysis option of CDM Tool 01 for both new and capacity addition projects under this methodology. Further, in the Barrier Analysis route, the barriers eventually need to be monetized to demonstrate that the project activity would not be feasible in absence of the revenue from the sale of credits. It is recommended to use the interbank rate of the country as the benchmark for an objective and credible analysis. All conditions applicable for the Benchmark Analysis in the CDM Tool 01 are applicable here as well. This step will also require the project proponent to conduct a Sensitivity Analysis as a confirmatory step to demonstrate project additionality.

Consideration for categorization by scale and use of the Barrier route:

a) Rationale behind categorization by scale: The primary reason for the categorization of projects by scale in the carbon world is to allow some relaxation and leniency for the small scale projects. For most industries, the facility size and unit cost of output are inversely proportional where the unit cost of output of small scale facilities may be so high that projects are rendered completely infeasible. As a result, small scale projects are afforded a degree of relaxation and leniency in project monitoring and other requirements. The reduced stringency level has allowed for a reduced cost burden and eased the flow of additional revenue from credits.

   Low market penetration, a high levelized cost of service and high capital costs, among others, are strong indicators of prohibitive barriers for some industries/technologies. We have found some reliable literature on the relation between penetration rate and market barriers. However, we are yet to find adequate and appropriate data to establish a correlation between market penetration and barriers from a cost perspective, and need to undertake further research on this front.

   The objective is to find a correlation between capacity and financial viability (i.e., to determine the threshold range of capacity at which a collection and/or recycling business becomes financially viable, benefiting from economy of scale) for a given type of a facility. Capacity may be determined based on metrics such as production (output)

capacity or throughput processing capacity of the facility. This threshold may vary by, among others, geography, material type and regulatory provisions.

b) Given the ongoing research to determine the correlation between capacity and financial viability, we suggest using the parameters of Capital Investment and Annual Revenue together to categorize projects by scale. The amount of annual Revenue for two project activities of the same scale of investment may vary based on the material type managed by the project (i.e., different material types have different demands and market rates).

c) Should it be possible to categorize projects by scale, additionality may be demonstrated using the Barrier route as prescribed in CDM tool Tool 21 *Demonstration of additionality of small-scale project activities, 2019, version 13.0*, latest version, using at least one of the following barriers:

- Investment barrier: Project faces capital or investment return constraints that can be overcome by the additional revenues associated with the sale of plastic collection credits.
- Technological barriers: Project faces technology-related barriers to its implementation.
- Institutional barriers: Project faces financial (other than identified in investment barrier above), organizational, cultural or social barriers that the plastic collection credits revenue stream can help overcome.

5. Questions for consideration: The challenges with categorization of projects by scale and the use of the "Barrier Analysis" route to demonstrate additionality are included in the Note to Reviewers. Given these challenges, we would appreciate your feedback on the following:

a) Should the distinction between small and large scale projects be included in this methodology, given the lack of data to support this categorization?
b) Should the categorization take into account regional data for a sample based on their capital investment and annual revenues, to establish a correlation between capacity and viability?
c) Would it be preferable to use the positive list and benchmark analysis for the first few years of the Plastic Program (i.e., eliminating the need for small vs. large scale categorization), until we have robust data to support such a categorization?

7.3.3 Common Practice Analysis: The project activity is considered eligible where the rate of collection of the relevant material type(s) in the region is less than 80 percent. The collection rate is calculated by dividing the total collection of the material type in the region by the total generation of the material type in the region. The data for this calculation may

be obtained from primary surveys or through secondary literature published and/or certified by a competent authority.

8 QUANTIFICATION OF PLASTIC WASTE COLLECTION

Project proponents shall use real time data to determine the additional plastic waste collection resulting from the project activity. Baseline collection can be determined by using real time data prior to the start of the project activity, data based on historical collection or parameters from third party studies.

Quantification of plastic waste collection, for each material type where feasible, shall be conducted using the baseline and project collection equations provided below.

8.1 Baseline Plastic Waste Collection

Baseline plastic waste collection is the amount of plastic waste that would have been collected in the absence of the project activity. Baseline collection shall be calculated using one of the following methods:

For new project activities that procure plastic waste by diverting it from historically existing stream(s)[23], the capacity of the existing waste stream shall be determined based on the maximum amount of annual waste management/movement from the previous three years. Waste management data may be obtained from primary surveys or from third party literature published/certified by a competent authority.

For capacity addition activities, the baseline collection capacity of the existing activity shall be determined from the maximum amount of collection by the activity in the previous three years for the same material types managed by the project activity. If the existing activity is less than three years old, then at least one year's data shall be used to determine baseline collection. Waste management data may be obtained from historical records of the waste collection system(s) that existed prior to the implementation of the project activity. This data may be obtained either from existing, publicly audited records or from studies conducted by qualified, independent third parties.

Baseline plastic waste collection is calculated as follows:

$$BC_{d,y} = \sum_{i=1}^{n} B_{collected,i,d,y} \qquad \text{(Equation 1)}$$

[23] A historically existing stream denotes a collection activity that transfers plastic waste to an appropriate end destination(s) and was active for at least one year prior to the start of the project activity

Where:

$BC_{d,y}$ = Total baseline plastic waste collection transferred to destination *d* in year *y* (tonnes)

$B_{collected,i,d,y}$ = Amount of material type *i* collected in the absence of the project activity and transferred to destination *d* in year *y* (tonnes)

8.2 Project Plastic Waste Collection

Project plastic waste collection is the amount of plastic waste that is collected by the project activity:

$$PC_{d,y} = \sum_{i=1}^{n} P_{collected,i,d,y} \quad \text{(Equation 2)}$$

Where:

$PC_{d,y}$ = Total plastic waste collected by the project activity and transferred to destination *d* in year *y* (tonnes)

$P_{collected,i,d,y}$ = Amount of material type *i* collected by the project activity and transferred to destination *d* in year *y* (tonnes)

8.3 Eligible Plastic Waste Collection in the Region

Net plastic waste collected by the project activity shall not exceed the amount of plastic waste in the region that is not collected or is collected and transferred to an end destination with less environmental benefit than that of the project activity.

The amount of plastic waste eligible for collection and/or transfer to a more appropriate end destination in the region by the project activity shall be determined by comparing the annual amount of plastic waste generated to the annual amount collected and transferred to end destinations with equal or greater environmental benefit than the project activity in the region. The project proponent shall demonstrate this using primary surveys or secondary literature available in the public domain and/or certified by a competent authority.

Eligible plastic waste collection is the amount of plastic waste in the region that is uncollected or is collected and transferred to an end destination with less environmental benefit than that of the project activity. Eligible plastic waste collection is calculated as follows:

$$EPWC_y = \sum_{i=1}^{n} (WG_{i,y} - WC_{i,y}) \quad \text{(Equation 3)}$$

Where:

$EPWC_y$ = Total eligible plastic waste collection in year *y* (tonnes)

$WG_{i,y}$ = Total amount of plastic waste generated in the region for material type *i* in year *y* (tonnes)

$WC_{i,y}$ = Total amount of plastic waste collected and sent to an end destination with equal or greater environmental benefit than that of the project activity for material type *i* in year *y* (tonnes)

The annual amount of plastic waste generated and collected in the region may vary over time. Therefore, the total eligible plastic waste collection may be re-evaluated during each monitoring period.

8.4 Net Plastic Waste Collection

The net plastic waste collected is the amount of plastic waste collected by the project activity that would not have been collected otherwise. Net plastic waste collection is calculated as follows:

$$NC_y = \sum_{d=1}^{m} \left(PC_{d,y} - BC_{d,y}\right) \quad \text{(Equation 4)}$$

Where:

NC_y = Net plastic waste collected in year *y* (tonnes)

If net plastic waste collection is greater than the eligible plastic waste collection for the region, the amount of net plastic waste collection shall not exceed that of the eligible plastic waste collection. This can be calculated as follows:

Where $NC_y > EPWC_y$, $NC_y = EPWC_y$ (Equation 5)

9 MONITORING

9.1 Data and Parameters Available at Validation

Data / Parameter	BC $_{d,y}$
Data unit	tonnes/year
Description	Total baseline plastic waste collection transferred to destination *d* in year *y*
Equations	Equation 1
Source of data	Measured or calculated on a dry basis
Justification of choice of data or description of measurement methods and procedures to be applied	As explained in Section 8.1
Purpose of Data	Calculation of baseline plastic waste collection

Data / Parameter	EPWC $_{y}$
Data unit	tonnes/year
Description	Total eligible plastic waste collection in year *y*
Equations	Equation 3

Source of data	Primary surveys or secondary literature available in the public domain and/or certified by a competent authority
Justification of choice of data or description of measurement methods and procedures to be applied	Provide justification for the data sources used to determine the annual amount of plastic waste generated and the annual amount collected and transferred to end destinations with equal or greater environmental benefit than that of the project activity in the region
Frequency of monitoring/recording	Project proponents may re-evaluate the total eligible plastic waste collection in the region for each monitoring period
Purpose of data	Calculation of net plastic waste collection

9.2 Data and Parameters Monitored

The following parameters shall be monitored and recorded during the crediting period.

Data / Parameter	$PC_{d,y}$
Data unit	tonnes/year
Description	Total plastic waste collected by the project activity and transferred to destination *d* in year *y*
Equations	Equation 2
Source of data	Measurement on a dry basis at the project site/facility
Description of measurement methods and	Direct measurement and recording of the weight, cross checked with the collection site/facility's invoice records and confirmed by goods receipt notes and/or receipts of payment. The measurement(s) will be done at the project site/facility

procedures to be applied	prior to sending the collected material to the end destination and/or at the appropriate end destination, depending on the contractual agreement between the project facility and the entity representing the end destination.
Frequency of monitoring/recording	Recorded every time collected material is sent from the project site/facility to the appropriate end destination
QA/QC procedures to be applied	The weigh bridges are calibrated at regular intervals or as and when prescribed by statutory requirements or manufacturer specifications
Purpose of data	Calculation of project plastic waste collection

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Data / Parameter	$EPWC_y$
Data unit	tonnes/year
Description	Total eligible plastic waste collection in year *y*
Equations	Equation 3
Source of data	Primary surveys or secondary literature available in the public domain and/or certified by a competent authority
Justification of choice of data or description of measurement methods and procedures to be applied	Provide justification for the data sources used to determine the annual amount of plastic waste generated and the annual amount collected and transferred to end destinations with equal or greater environmental benefit than that of the project activity in the region

Frequency of monitoring/recording	Project proponents may re-evaluate the total eligible plastic waste collection in the region for each monitoring period
Purpose of data	Calculation of net plastic waste collection

9.3 Description of the Monitoring Plan

The project proponent shall establish and apply quality management procedures to manage data and information. Written procedures shall be established for each measurement task outlining responsibility, timing and record location requirements. The greater the rigor of the management system for the data, the easier it will be to conduct an audit for the project.

Record keeping practices shall include the following procedures:

- Electronic recording of values of logged primary parameters for each measurement interval;
- Offsite electronic back-up of all logged data;
- Written logs of operations and maintenance of the project system including notation of all shut-downs, start-ups and process adjustments; and
- Storage of all documents and records in a secure and retrievable manner for at least two years after the end of the project crediting period.

Quality assurance/quality control (QA/QC) shall also be applied to add confidence that all measurements and calculations have been made correctly. These include, but are not limited to:

- Protecting monitoring equipment (e.g., sealed meters and data loggers);
- Protecting records of monitored data (e.g., hard copy and electronic storage);
- Checking data integrity on a regular and periodic basis (e.g., manual assessment, comparing redundant metered data, and detection of outstanding data/records);
- Comparing current estimates with previous estimates as a ‘reality check’;
- Providing sufficient training to operators to perform maintenance and calibration of monitoring devices;
- Establishing minimum experience and requirements for operators in charge of the project and monitoring; and
- Performing recalculations to make sure no mathematical errors have been made.

APPENDIX I: EXAMPLE PROJECT ACTIVITIES

Table A1: Examples of eligible collection activities

Project Proponent	Collection Process	End Destination	Sector
Municipality/Local Authority (government, semi-government, quasi-government)	• House to house (door to door) collection • Curb-side and secondary collection points • Through waste pickers from dump sites, water bodies, and unmanaged landfills • From industrial and commercial establishments	• Managed landfills • Waste to energy plants (e.g., incineration of MSW with energy recovery, gasification of RDF) • Industries for use as fuel and/or feedstock (co-processing, pyrolysis, gasification, polymerization, monomerization) • Mechanical recycling • Use in construction materials	Formal
Material Recovery Facility (MRF) and/or Recycling Facility			Informal/ Formal
Waste Management Agency[24]			Informal/ Formal
Manufacturing Facilities[25] such as: (a) chemical companies using waste plastic as feedstock; (b) cement companies using waste plastic as alternative fuel; (c) construction companies using waste plastic as construction material (d) energy companies using waste plastic for energy recovery through incineration or gasification	Mobilized by Companies/ Manufacturing Facilities through • Informal waste pickers • Producer Responsibility Organisations, as part of EPR • Waste Management Agencies	• Mechanical recycling • For use as feedstock • For use as alternative fuel • For use as construction material • For energy recovery through incineration or gasification	Informal/ Formal
Producers and Brand owners (i.e., entities importing, producing and using packaging materials)			Informal/ Formal

[24] Agencies that facilitate collection/recycling of waste through mobilization of waste pickers, aggregators, bailers/sorters, MRFs, recyclers, engagement with regulatory bodies, Producer Responsibility Organizations and all relevant players in the waste management supply chain as applicable; ensures that the concerned waste management system operates in an environmentally sound and socially just manner

[25] End-user of collected/recycled materials or facility that includes industrial processes which transform the processed materials sent from collection/recycling or processing facility(ies) into finished products

Volunteer Groups/ Organizations	Voluntary Beach/Nature clean-ups by • Group of individuals, clubs • CBOs, NGOs (with or without the help of informal waste-pickers)	• Sanitary landfill • For mechanical/ chemical recycling	Informal

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