



ReSource Footprint Tracker

Methodology Overview

VERSION 2.0
AUGUST 2021







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Introduction

About *ReSource: Plastic*

Plastic waste is choking the planet, polluting the air, water, and soil that both people and wildlife need to survive. And with plastics threatening the natural environment on which we depend, change can't wait. As this crisis spreads to every corner of the globe, World Wildlife Fund (WWF) is leading the charge to help reimagine how we source, design, dispose of, and reuse plastic materials upon which most communities depend. Because while plastic can help make our hospitals safer, our food last longer, and our packages more efficient to ship, it has no place in nature.

To tackle the complex scope and large scale of the global crisis, WWF's No Plastic in Nature initiative is engaging everyone—from policy makers and the public to cities and companies—around critical efforts to transform the broken plastic system. Through the *ReSource: Plastic* activation hub, WWF is tapping into an especially powerful lever for change: business.

Business is uniquely positioned to affect change at scale and across the value chain of plastic. Companies can reduce plastic waste both within the control of their supply chain—how plastic is sourced and how its products are designed, managed, and reused—and beyond it, through interventions in waste management, public policy, and collective action.

While some of the world's most powerful companies have already gotten started with plastic commitments to

reduce, re-source, recycle, and more, they need to move from aspiration to impact.

ReSource: Plastic partners with companies that are ready to translate plastic commitments into meaningful and measurable action but need a road map to get there. *ReSource* closes that “how” gap through an innovative measurement framework that helps companies take actions aligned to a three-pronged approach to systems change:

- Eliminate unnecessary plastic through business model innovation, reduction, and substitution.
- For plastic that is necessary, shift from virgin plastic sourcing to sustainable inputs, including recycled content, responsibly sourced biobased content, and advanced materials.
- Double rates of global collection, recycling, and composting of plastic so that the plastic going into the system is circulated back.

ReSource does this by helping companies **measure** and track the impact of their plastic mitigation activities through annual public reporting, **maximize** the potential for impact by using data-driven insights to shape activities, and **multiply** this impact by fostering collaboration and opportunities for collective action with other *ReSource* members and partners.

Fossil Virgin Plastic

Design

Use

Reuse

Recycling

Leakage

Outflow to Landfill and Incineration

Double global recovery

Eliminate plastic pollution

Shift to sustainable sources for plastics

Reduce unnecessary plastics

The Ellen MacArthur Foundation and Ocean Conservancy, leaders in the global effort to stop plastic pollution, are thought partners to WWF on *ReSource*.

The purpose of this document is to provide a comprehensive look into the methodology of *ReSource's* innovative framework to measure and report corporate action on plastic, the Resource Footprint Tracker.

About the Methodology

The ReSource Footprint Tracker is the mechanism used to measure *ReSource: Plastic* member companies' impact on plastic waste mitigation. The tool was developed to improve the way companies solve a high-stakes and complex problem—a problem in which effective corporate action can potentially lead to positive and large-scale transformation.

In addition to serving as a tool for *ReSource* member companies, the Tracker was built to fill a critical measurement gap in effectively advancing corporate plastic sustainability at large. With these goals in mind, the ReSource Footprint Tracker methodology is designed to:

- render a more complete and updated corporate plastic footprint profile, aligning company plastic portfolios with the global waste management system
- measure and track the progress of member companies' plastic waste mitigation activities

- produce data-driven insights to help companies sharpen, refine, and prioritize activities that can maximize their potential for impact
- help companies multiply their impact by fostering new opportunities for collaboration and collective action with other companies and across sectors
- establish a common language and framework on corporate plastic sustainability

The ReSource Footprint Tracker was piloted in 2019 by five *ReSource* member companies to demonstrate the feasibility of the methodology and establish baseline footprints, resulting in a proof of concept for a common framework to measure effective corporate action on plastic. Please refer to the [Transparent 2020](#) report for the outcomes of the pilot year assessment.

The following sections of this document detail the methodology's components, data limitations, and assumptions, and its practical interpretations and applications.



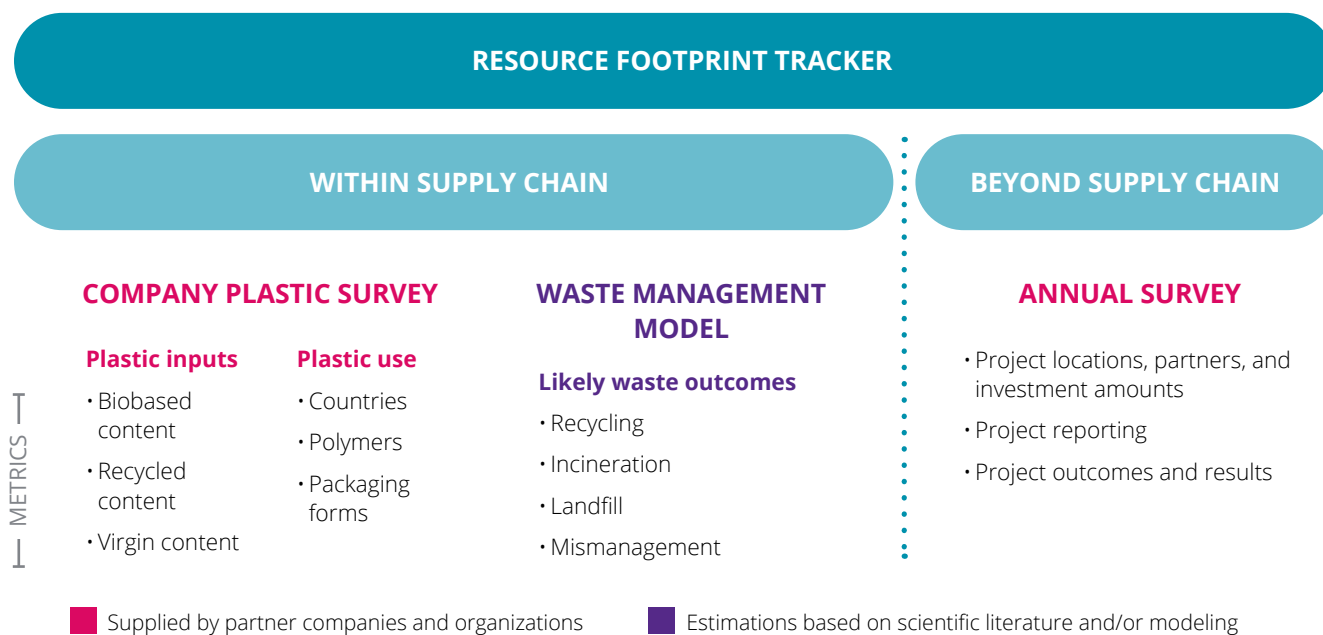


Tracker Components

The ReSource Footprint Tracker methodology consists of three main components: the Company Plastic Survey to measure plastic use by country, polymer type, form, and use of sustainable inputs; the Waste Management Model to estimate likely waste management outcomes for this plastic; and the Beyond Supply Chain Survey to track a

company's initiatives and investments to reduce plastic pollution beyond their own supply chains (Figure 2). WWF led in the development of the methodology with support and alignment on best practices from *ReSource* thought partners as well as The Recycling Partnership, Circulate Capital, and the Plastic Leak Project.

FIGURE 2. ReSource Footprint Tracker data components



Company Plastic Survey

The Company Plastic Survey collects member company plastic procurement and/or sales data, which is used to analyze plastic inputs and packaging types, including polymer and form. This is used to understand the composition of a company's plastic portfolio and subsequently inform strategies for eliminating unnecessary plastic and shifting to sustainable inputs.

Member companies are asked to report data regarding plastic use within the supply chain. This section describes the data collected and reported through the Tracker's Company Plastic Survey. This section should be used to help member companies identify the types of operations and polymers that are within scope for annual reporting. The outputs from the tool will provide information on the different plastic packaging formats and plastic resins used by the company.

Note that the primary focus of the Tracker is on single-use plastic consumer products and packaging. However, the Tracker is designed to also capture durable products and reusable packaging, which allows for year-over-year tracking of the shift away from single-use plastics.

DATA COLLECTION

ReSource members populate the Company Plastic Survey with procurement and sales data on all single-use plastics, including "back of house," and packaging for shipping through an Excel spreadsheet developed by Eastern Research Group, Inc. (ERG). Additional data elements required to complete the analysis include the

year of data collection, country of sale/use, packaging form, and weight broken down by polymer type and whether the material is comprised of recycled content or responsibly sourced biobased content, where applicable (Figure 3). A company must identify an internal point person to gather procurement and/or sales data and share their data with WWF within six months of joining ReSource.

SCOPE OF ANALYSIS

The data provided by companies and inputted into the Tracker will vary by industry or sector.

The scope of the Company Plastic Survey includes:

- coverage of all direct operations, as determined by the company, including but not limited to manufacturing, retail, consumer packaged goods, and licensed and international operations^A
- coverage of all single-use plastics, including "back of house" plastics consumed and managed internally, as well as one-way and reusable packaging for shipping
- documentation of all assumptions and calculations; e.g., estimations of plastic product weight based on unit/case weight

In cases where data constraints make it unrealistic for a company to accurately report all plastics in their direct operations, it is critical that the company fully discloses the limitations of their reported data and anything that has been excluded.

FIGURE 3. Example of Company Plastic Survey (Tracker user interface)

Select from the drop down list	Select from the drop down list	Select from the drop down list	Write in a form description.	Enter total plastic weight (weight of plastic in package * number of units)	Enter weight units	Enter the percentage of recycled and biobased plastic inputs. <small>Note: The remaining percentage is assumed to be from virgin fossil fuel.</small>
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Global Commitment Packaging Category	Form - Category	Primary Polymer Type	Form - Description	Total Plastic Weight	Weight Units	Recycled Content (%)	Biobased Content (%)
PET Bottle	Bottle	PET	Bottle	988	tonnes	30%	0%
PP Other Rigid	Other Rigid	PP	Cup	325	tonnes	0%	0%
<A4 multmaterial flexibles	Other Flexible		Carton	84	tonnes	0%	0%
Other	Small Plastics	PP	Straw	57	tonnes	0%	0%
>A4 mono-material PE flexibles in B2B context	Mono-material Film	LDPE	Shrink wrap	124	tonnes	0%	0%

^A For additional information about scope of reporting for principal members, see [Transparent 2020 Report](#).

Note that due to data constraints in the first year of reporting, the scope of analysis did not include secondary packaging and transport packaging. Additionally, some members were unable to report data for every country in which they operate. The intention is to standardize the requirements for the scope of reported data in the coming years.

DATA ELEMENTS AND DEFINITIONS

This section contains detailed information about each of the data fields requested in the Company Plastic Survey. WWF identifies priority and secondary tiers of data elements. WWF encourages members to provide as much data as possible to ensure completeness in tracking plastic use (Table 1). Priority data are necessary to produce the tables and charts on the dashboard in the Tracker's web tool. Secondary data are not necessary to produce the summary tables and charts but do help to provide a more complete picture of a company's annual plastic use and waste management.

1. Country

All plastics data must be linked to a country so that management outcomes can be determined through country level waste management calculations. If only regional data are available, the data are split among the countries that constitute a region using the best estimate for each country (e.g., allocated based on country-level sales data); this is then noted in the company's data scope and assumptions.

2. Plastic Use Classification

This field groups plastic products and packaging into one of three pre-set options, as described in Table 2. The purpose of this field is to further classify plastic products either as products for sale or direct use by a company, or as packaging on products sold or procured by a company. The Tracker relies on the following definitions:

Packaging: Per ISO 21067-1:2016, "Product to be used for the containment, protection, handling, delivery, storage, transport and presentation of goods, from raw materials to processed goods, from the producer to the user or consumer, including processor, assembler or other intermediary."

TABLE 1. Priority and Secondary-Tier Data in the Company Plastic Survey

Data Element	Data Tier
Country	Priority
Plastic Use Classification	Priority
Procurement or Sales	Priority
Global Commitment Packaging Category	Priority
Form Category	Priority
Primary Polymer Type	Priority
Form Description	Priority
Total Weight	Priority
Weight Units	Priority
Percent Recycled Content	Priority
Percent Biobased Content	Priority
Mono-material or Multi-material Designation	Secondary
Primary Polymer Percent	Secondary
Secondary Material	Secondary
"Other" Secondary Material	Secondary
Responsible Sourcing of Biobased Content	Secondary
Sourcing Justification	Secondary
Compostability	Secondary
Recyclability Assessment	Secondary
Durable Product Designation	Secondary
Reusable Packaging Designation	Secondary
End Use/Fate of Product	Priority
Internal Management	Secondary
Additional Notes	Secondary

Plastic for product use: Plastic in the actual product that is used by the end user and does not fall under the definition of packaging. The product can be either durable or non-durable.

Plastic packaging on purchased items and **Plastic for packaging of sold products:** These include primary, secondary, and tertiary packaging. Per ISO 21067-1:2016, primary packaging is designed to come into direct contact with the product; secondary packaging is designed to contain one or more primary packaging together with any protective materials where required; tertiary

packaging is designed to contain one or more articles or packages, or bulk material, for the purposes of transport, handling, and/or distribution.

This distinction and resulting data aggregation provide the member company and WWF with detailed information about the breakdown of plastics used in products and in packaging on those products, which could help identify unnecessary plastic use in the supply chain.

3. Procurement or Sales

This field accounts for the various types of plastic products and packaging consumed within the supply chain. As noted above in the “Scope of Analysis” section, some industries may find that reporting only procurement or only sales data is appropriate for the Tracker. Other industries may report both types of data.

Procurement: Plastics procured by the member company, which could either be discarded in-house, sold to businesses, or sold directly to the consumer.

Sales: Plastics sold to businesses or directly to the consumer.

Please note that companies may report a combination of procurement and sales data, such as in the case of a company that both manufactures plastic forms (such as bottles) and procures other forms (such as caps and labels). Because the Tracker is primarily interested in the final form of the plastic, manufactured plastics would typically be reported as sales data.

4. Global Commitment Packaging Category

To align with the New Plastics Economy Global Commitment reporting, members can select one of 18 predetermined categories (Table 3). After selecting a packaging category, the Form Category and Primary Polymer Type will be auto-populated. If a packaging product does not fit within one of the categories, members can select “Other” and can select from other form categories and polymer types.

5. Form Category and Form Description

The Tracker allows for data entry in eight form categories. Classifying by category allows for data to be compiled and visualized for simplified year-over-year reporting. The form category will auto-populate based on the selection of Global Commitment Packaging Category. If members select “Other” from the Global Commitment Packaging Category, they are required to select one of the eight form categories in this field.

Form Category: This field is used to classify the wide range of plastic products into broader categories for data aggregation and reporting across the wide variety of companies using the tool. By creating categories that cover a variety of plastic types, WWF can create a high-level overview of plastic use and compare across member companies from a variety of industry types. This field is a pre-set list of eight categories to which all company plastic should be assigned.

TABLE 2. Plastic Use classifications

Classification	Description	Examples (non-exhaustive)	Procurement or Sales
Plastic for product use	Plastic for direct use in a product sold or used by company	Plastic kitchen utensils; plastic toothbrushes; plastic stems in cotton swabs	Could be either procurement or sales
Plastic packaging on purchased items	Plastic packaging on incoming purchased items used by company, and removed and managed by company	Plastic sleeves on cups purchased; plastic jugs for milk used as a beverage ingredient; plastic packaging used to ship empty personal care bottles and caps to fill with a consumer product	Always procurement
Plastic for packaging of sold products	Plastic purchased for use in packaging products sold to a consumer, retailer, or business customer	Plastic cups purchased for selling beverages; plastic wrap used to secure filled cases of filled personal care bottles to pallets; protective wrap around rolls of coated rollstock shipped to fillers	Could be either procurement or sales

TABLE 3. Global Commitment Packaging Categories

Packaging Classification	Packaging Category	Category Description
Rigid	PET bottles	Bottles for beverage, cooking oils, detergent, cosmetics,...
	PET Thermoforms	Trays, cups, blisters,...
	Other PET rigid	Jars,...
	HDPE Bottle	Milk, yoghurts, jelly bottles,...
	HDPE other rigids	Bottles for yoghourts, jelly,...
	PP Bottle	
	PP Other rigid	Pots, tubs, trays, cups, jars,...
	PE Tubes	
	PS rigid	Pots, trays,...
	EPS rigid	Clamshells,...
	PVC rigid	Blisters, bottles, trays,...
Flexible	>A4 mono-material PE flexibles in B2B context	Pallet wraps, large LDPE bags,...
	>A4 mono-material PE flexibles in B2C context	Wrap around bottles, wrap around toilet paper,...
	Other >A4 flexibles	
	<A4 PE flexibles	Pouches, sachets, wrappers, small bags, ...
	<A4 PP flexibles	Pouches, sachets, wrappers, small bags, ...
	<A4 multimaterial flexibles	Pouches, sachets, wrappers, small bags, ...
Rigid/Flexible	Other	

Form Description: This field is primarily available to companies to facilitate internal tracking at a more granular level than the form category data field allows. The form description allows for a more detailed look at the plastic forms used and will vary greatly across industries and companies.

The form categories are defined in Table 4. A list of possible form descriptions is provided for each form

category. That list is non-exhaustive and will change over time as new forms and products enter and exit the market.

6. Primary Polymer Type

Primary polymer type will also auto-populate based on the Global Commitment Packaging Category selection. If users select “Other” for the form category, they will be required to select one of the 19 polymer types.

TABLE 4. Form categories and descriptions from ReSource Footprint Tracker

Packaging Classification	Form Category	Form Category Definition	Examples
Rigid	Bottle	Per ISO 21067:2016: typically of glass or plastic, having a comparatively narrow neck or mouth, with a closure and usually no handle.	Bottles for water, soft drinks, cooking oils, detergents, milk, jelly; large refillable water containers...
	Closure	Includes caps and closures that would be left on containers going to recycling (caps/closures that would be disposed of separately from the primary container would fall under small plastics—problematic to recycle as separate components due to size)	Screw caps on plastic bottles...
	Rigid—foam	Rigid products made from foamed polymers, typically polystyrene (PS)	Foamed products like EPS cups, foamed PS plates, egg cartons, meat and produce trays...
	Other rigid	Category used to capture rigids that are not classified as bottles, closures, foamed rigids, or small plastics	Solid cups, jars, disposable utensils, thermoforms, trays, blisters, non-foam clamshells...
Rigid/Flexible	Small plastics	As defined by the Association of Plastic Recyclers (APR): items smaller than two inches in two dimensions require testing to determine the appropriate APR recyclability category ¹	Plastic coffee sticks, straws, utensils...
	Raw material	Polymer used as raw material for manufacturing plastic products or packaging	Polymer pellets used as primary content of molded or extruded product, polymer used as coating or barrier material
Flexible	Mono-material film	Mono-material stretch and shrink films, as defined by ISO 21067-1:2016, or mono-material film bags and sacks that are suited for recycling Shrink film: plastic material that shrinks in size when heated to conform to the item(s) packaged Stretch wrap: material that elongates when applied under tension and which, through elastic recovery, conforms to item(s) packaged	Pallet wrap, stretch or shrink wrap around products for shipment, single-use plastic grocery bags...
	Other flexible	Includes multi-material/laminate films	Direct product packaging, laminated beverage or food pouches, metallized films, snack bags and wrappers...

TABLE 5. Polymer types

Polymer Type	Notes
Polyethylene terephthalate (PET)	
Polyethylene terephthalate glycol (PETG)	
High-density polyethylene (HDPE)	
Polyvinyl chloride (PVC)	
Low-density polyethylene (LDPE)	
Linear low-density polyethylene (LLDPE)	
Polypropylene (PP)	
Polystyrene (PS)	Includes EPS, GPPS
Polylactic acid (PLA)	Biopolymer
Polybutylene adipate terephthalate (PBAT)	Biopolymer
Polybutylene succinate (PBS)	Biopolymer
Polybutylene succinate adipate (PBSA)	Biopolymer
Polyethylene furoate (PEF)	Biopolymer
Polyhydroxyalkanoate (PHA)	Biopolymer
Nylon	Catch-all category
Ethylene vinyl alcohol (EVOH)	Mostly an additive
Polyvinyl alcohol (PVOH)	Mostly used as coating/additive
Polycarbonate (PC)	
Acrylonitrile-butadiene-styrene copolymer (ABS)	Mostly used in durable goods

If the form is composed of multiple polymers, or a polymer and another non-plastic material, members should report the primary plastic polymer. If the form is made up of only one polymer type, users will report the polymer.

The Tracker is designed to capture all plastic products made from the polymers listed in Table 5. WWF will update the polymer list as new packaging and polymers are developed.

7. Total Weight and Weight Units

The total weight of the plastic portion for the form described in the row is reported. The total weight can be calculated by multiplying the weight of the plastic in the package by the total number of units sold/procured over the reporting period. Any secondary material will not be used in the Waste Management Model.

If purchasing a multi-material product such as plastic-coated paper cups, only the weight of polymer coating on the paper cup is reported. If the weight of

polymer in the cup is not known, an estimate based on supplier or manufacturer information should be provided and justification should be included.

8. Percent Recycled Content

The percent of the total plastic weight made from recycled content is reported. Recycled content as indicated only refers to post-consumer recycled content. The “Recycled Content” designation does not include pre-consumer recycled content.

The Tracker relies on the ISO 14021:2016 definition of post-consumer recycled content or the definition of pre-consumer recycled content:

Post-consumer recycled content: The proportion, by mass, of post-consumer recycled material in a product or packaging.

Pre-consumer recycled content: Materials diverted from the waste stream during a manufacturing process.

The Tracker does not include pre-consumer recycled content since an ideal circular economy would avoid pre-consumer waste in optimized production practices.

9. Percent Biobased Content

The percent of the total plastic weight made from biobased content is reported. WWF is interested in tracking plastic from biobased sources as bioplastics and biomaterials represent a shift toward a bio-economy in which appropriate goods and packaging are made from responsibly sourced biomass.

Biobased content has been defined (by the U.S. Department of Agriculture in the Farm Security and Rural Investment Act of 2002) as “a commercial or industrial product (other than food or feed) that is composed, in whole or in significant part, of biological products, including renewable domestic agricultural materials (including plant, animal, and aquatic materials), forestry materials, intermediate materials, or feedstocks.”² If relevant, companies should indicate if biobased content is responsibly sourced.

10. Mono-material or Multi-material Designation

The mono- and multi-material designations are used to capture plastics that are used in multi-material forms where the secondary material type may be a different polymer or a non-plastic material. For example, plastic coating on paper cups or rollstock should be included in the Tracker even though 100% of the form is not plastic.

This designation helps determine the recyclability of a form. For example, a plastic bottle with a barrier or coating layer may not be recyclable, unlike a bottle with no added coating layer.

Mono-material: A form that contains only one type of polymer, including different versions of the same polymer. For example, a bottle made with both virgin and recycled PET content would be considered mono-material. The addition of other polymers or additives to a plastic form can still classify the product as mono-material if the additives do not render the package non-recyclable. See the [Association of Plastic Recyclers’ Design Guide](#) for full guidance on recyclability.

Multi-material: Generally, a multi-material product

is a form that contains more than one type of polymer, or polymer and non-polymer materials. Examples include plastic bottles with a different polymer barrier layer or coating, polymer-coated paperboard products, multilayer laminate films containing several polymer types or a mix of polymer and paper and/or foil, metallized films, etc.

WWF recognizes two definitions for multi-material products:

1. Per the Sustainable Packaging Coalition, “Multi-material flexible packaging is composed of two or more materials joined together with adhesive or wax. By layering different materials together, manufacturers can create a package with unique barrier and mechanical properties.”³
2. Per WRAP, “Laminated packaging is an increasingly popular option for lightweight product packaging, comprising multiple thin layers of material, each with a particular function.”⁴

Please note that a product or packaging’s material composition at recycling/disposal is more relevant to the Tracker’s classification of mono- or multi-material than it is at point of sale to consumer.

If the materials or components of multi-material forms are likely to be disposed of together and/or can be recycled together, the product should be reported on one line item. For example, bottles and caps that can be recycled together should be recorded as one line item, with the percentage weight of the bottle and the polymer of the cap indicated. If the materials or components are likely to be disposed of separately, the materials should be recorded on different line items and can each be classified as mono-material, if applicable. For example, a shrink band that needs to be removed in order to open a bottle should be recorded on a separate line item from the bottle and the cap.

For further guidance on multi-material products, refer to [The Recycling Playbook](#) for best practices regarding material of labels, attachments, and closures to increase recyclability.

11. Primary Polymer Percent and Secondary Material

Primary polymer percent and the secondary material description are secondary data fields.

The information can be used to help determine recyclability and waste management outcome modeling based on the total material composition of a form.

12. Responsible Sourcing of Biobased Content

WWF defines responsibly sourced biobased content based on a definition provided by the Bioplastic Feedstock Alliance. Under their definition, responsibly sourced biobased content is, at a minimum:⁵

- legally sourced
- derived from renewable biomass
- posing no adverse impacts on food security
- having no negative impact on land conversion, deforestation, or critical ecosystems
- providing environmental benefits

Credible certifications, such as the Roundtable on Sustainable Biomaterials certification, can help ensure responsible sourcing.

13. Sourcing Justification

Member companies must submit written justification for how material content meets WWF's criteria for "responsibly sourced biobased content."

Justification should include documentation that verifies the content is responsibly sourced per WWF's definition, or that it adheres to a credible certification standard. Guidance for WWF's Principles of Certification can be seen [here](#).

14. Compostability

Compostability can vary by waste management practices and conditions for material composition, design, use, contamination, and collection.

The data collected serves to track whether the form meets the following definition of "compostable" from the New Plastics Economy Global Commitment: "Packaging or packaging component is compostable if it is in compliance with relevant international compostability standards and if its successful post-consumer collection, (sorting) [sic], and composting is proven to work in practice and at scale."⁶

15. Recyclability Assessment

WWF acknowledges that recyclability varies widely due to many factors, including but not limited to varying waste management practices dependent on material composition, design, use, contamination, and collection.

Note that for this designation, the Tracker is **not** asking if the form is ultimately recycled. The Recyclability Assessment is based on the New Plastics Economy Global Commitment Recyclability Assessment Tool and serves to track if the form meets the following Global Commitment definition of "recyclable":

"A packaging or packaging component is recyclable if its successful post-consumer collection, sorting, and recycling is proven to work in practice and at scale. A package is considered recyclable if its main packaging components, together representing greater than 95 percent of the entire packaging weight, are recyclable according to this definition, and if the remaining minor components are compatible with the recycling process and do not hinder the recyclability of the main components."

Source: New Plastics Economy Global Commitment⁷

The Global Commitment recyclable definition applies at a global level and does not account for any local and regional context that impacts recyclability. WWF is exploring how to incorporate local and regional conditions into the recyclable definition as the Tracker evolves.

The first step of the recyclability assessment considers whether a 'system for recycling' exists in practice and at scale for your plastic packaging globally (e.g., does this packaging category achieve a 30% post-consumer recycling rate in multiple regions, collectively representing at least 400 million inhabitants?) and locally (30%

post-consumer recycling rate in the local market). This field will be automatically populated based on the polymer and form of the packaging. The local recyclability assessment is currently only available for products procured/sold in the United States, as the inclusion of the local recyclability assessment is primarily for U.S. Plastics Pact reporting.

When “Other” is selected as a Global Commitment Packaging Category, users will be able to input a subjective assessment of whether they consider a ‘system for recycling’ to exist. Otherwise, it can be left blank.

The second step of the recyclability assessment involves manually inputting the “share of packaging that ‘fits’ the system for recycling.” For example, while a system for recycling exists in practice and at scale for PET bottles, the recycling of a specific bottle could be hindered by size, colorants, additives, labels, caps/lids, glues, inks, etc. Various design-for-recycling guidelines, tools, and testing methods are available from the Association of Plastics Recyclers, Plastic Recyclers Europe, European PET Bottle Platform, and many other groups.

More information and guidance on the recyclability assessment can be found in Appendix II of the [Global Commitment Reporting Guidelines](#) document.

16. Durable Product Designation

This is a secondary data field, included in the Tracker to track and incorporate durable products for future versions of the Waste Management Model.

The purpose of the designation is to track the flow of durable products procured and/or sold by the company each year. Note that durable goods are excluded from the model because they are generally estimated to have a lifetime of three years or more, a definition provided by the US Environmental Protection Agency (EPA).

17. Reusable Packaging Designation

This is a secondary data field, included in the Tracker to track changes in plastic waste associated with the use of reusable packaging over time. The Tracker aligns with the ISO 18603:2013 definition of packaging reuse as cited in the New Plastics Economy Global Commitment, namely:

“[An] operation by which packaging is refilled or used for the same purpose for which it was conceived, with or

without the support of auxiliary products present on the market, enabling the packaging to be refilled.”

Further, ISO 18603:2013 defines reusable packaging as: “Packaging which has been designed to accomplish or proves its ability to accomplish a minimum number of trips or rotations in a system for reuse.”⁸

ISO defines a trip as transfer of packaging from filling/loading to emptying/unloading. ISO defines a rotation as a cycle undergone by reusable packaging from filling/loading to filling/loading.

As discussed in the New Plastics Economy Global Commitment Reporting Guidance, attention should be paid to the intended use and function of the packaging. If packaging is being employed for a secondary use (rather than the same purpose for which it was designed), it is not considered reusable packaging. For a container to qualify as reusable, there should be a system for reuse in place enabling the user to ensure that it is reused in practice. This system should be able to prove a significant actual reuse rate (or average number of use-cycles of a package), in normal conditions of use.

18. End Use/Fate of Product

The end use/fate of product must be designated for each form reported into the Tracker to model the management pathways. There are four options as described in Table 6.

19. Internal Management

These secondary data fields help companies assess internal waste management if “Discarded In-House” was selected for End Use/Fate of Product. These fields are intended to capture the fate of pre-consumer waste managed by companies at their own facilities. For post-consumer waste, these fields should be left blank as country-level fate assumptions will be applied through the ReSource Footprint Tracker Waste Management Model.

20. Additional Notes

This space is provided for any additional notes not already captured in the Tracker. Notes can include but are not limited to explanations regarding internal data aggregation, missing or estimated data, and assumptions related to company data collection and reporting.

TABLE 6. End Use/Fate of Product

Category	Description	Waste Management Model Assumption
Sold to business	<p>This category should capture forms that are sold to the following industry categories:</p> <ul style="list-style-type: none"> • Packaged goods companies, including fast-moving consumer goods (FMCG) • Packaging producers • Raw material producers • Durable goods producers • Suppliers to the plastic packaging industry <p>This category is selected for products sold to and branded by another company. This category does not include branded products sold to a retailer</p>	<p>Assume country in which product is sold is also where it is managed; assume form sold to filler does not change substantially enough to impact management.</p> <p>These products will be left out of any aggregation across companies to eliminate the potential for double counting.</p>
Sold to retailer	<p>This category should capture forms that are sold to retailers or other intermediaries for the product before it reaches the consumer.</p>	<p>Assume country in which product is sold is also where it is managed; assume form sold to retailer does not change substantially enough to impact management.</p>
Sold to consumer	<p>This category captures all forms sold directly to the consumer by the reporting company. Note that the consumer could be a business consumer, for example a company purchasing, using, and disposing of products managed by a commercial hauler.</p>	<p>Assume country in which product is sold is also where it is managed.</p>
Discarded in-house	<p>This category captures all plastics procured by the company, used and discarded in-house. This can include both pre-consumer and post-consumer waste.</p>	<p>Assume post-consumer waste for waste management model. For pre-consumer waste, waste management outcomes can be reported by the company in the Internal Management field.</p>

COMPANY PLASTIC SURVEY ASSUMPTIONS

Assumptions regarding data collected in the Company Plastic Survey are summarized below.

- country assignment and Waste Management Model assumptions
 - For plastics where only procurement data are available and/or are the only data entered in the Tracker, the assigned country of procurement is also the country in which material management occurs.
 - For plastics sold to another business before being sold to the consumer, the ultimate end user and disposer of the plastic, the country of sale is assumed to be the country in which material management occurs.
 - For plastics sold to a retailer, the model assumes that the country in which a product is sold is also where it is managed.
- For plastics sold to the consumer, the country of sale is assumed to be the country in which material management occurs.
- For plastics discarded in-house, waste is assumed to be post-consumer and waste management outcomes are determined by the model unless the company specifies otherwise.
- total weight
 - To calculate total plastic procured/sold, the Tracker assumes that the weight reported is the total weight of the plastic material of a form, even if the final product form is comprised of plastic and another non-plastic material.
- mono- and multi-material designation
 - If the components of a multi-material product can be recycled or disposed together, the product is considered mono-material. If the components cannot be recycled or disposed together, the product is considered multi-material.



Waste Management Model

The ReSource Footprint Tracker's Waste Management Model is designed to estimate the share of consumer-facing plastic packaging for individual companies that is recycled, landfilled, incinerated, or mismanaged around the world, at a national level. The outputs of the model are intended to help companies identify opportunities in key geographies to eliminate or substitute plastics at high risk of mismanagement, design for local recycling or composting infrastructure, and invest in improving waste management systems.

The model was developed by Anthesis Group, with review and input from WWF, key thought partners, and *ReSource* member companies in fall 2019 and winter 2020. We also collaborated with The Recycling Partnership, Circulate Capital, the Plastic Leak Project, and other organizations to align the Waste Management Model methodology with current best practices.

Other methodologies exist to help various stakeholders track their plastic usage and/or waste management outcomes. However, the ReSource Footprint Tracker fills previous gaps by standardizing corporate data and collection and reporting as well as by improving the quality and precision of our understanding of the plastic waste system. To avoid the proliferation and duplication of efforts, the ultimate goal is to align this model with other approaches to support streamlined reporting.

MANAGEMENT OUTCOMES DEFINITIONS

The model identifies four waste management outcomes for consumer-facing plastic packaging: recycling, incineration, landfill, and mismanagement.^B

Recycling

According to the US EPA, "recycling is the process of collecting and processing materials that would otherwise be thrown away as trash and turning them into new products."⁹ Recycling can be either mechanical or chemical.

Incineration

Incineration includes incineration both with and without energy recovery. Incineration primarily occurs in high-capacity, high-income, and land-constrained countries, as the construction and operation of incineration facilities require large capital inputs and high management and technical capacity.¹⁰

Landfill

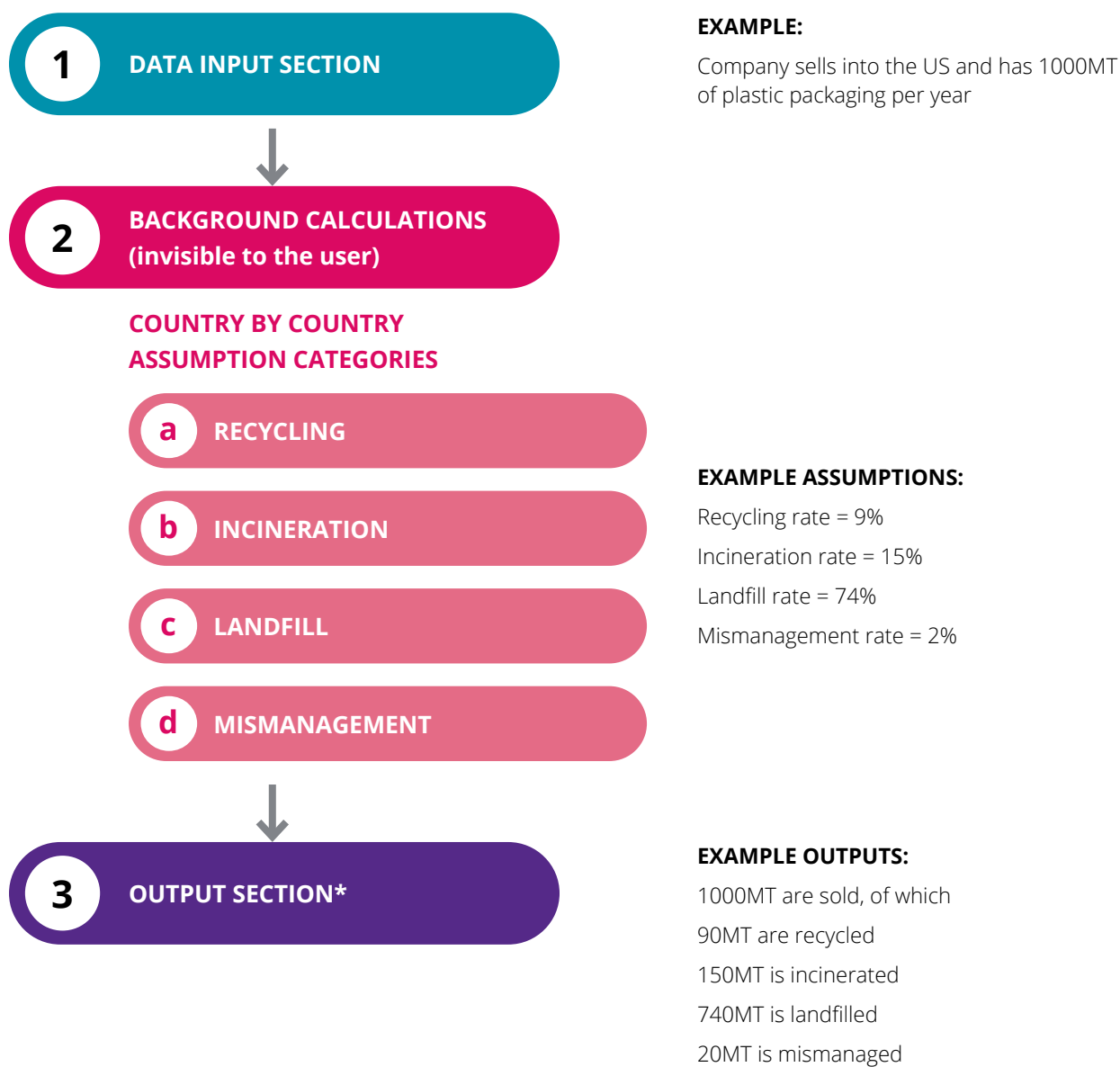
Landfill refers to waste treatment and disposal in 1) sanitary landfills with landfill gas collection systems, 2) controlled landfills that are engineered but gas collection systems either do not exist or are not known to exist, and 3) unspecified landfills. Waste bound for unspecified landfills is categorized as either landfilled or mismanaged on a country-by-country basis. Open dumps are categorized under mismanaged waste.¹¹

Mismanagement

We follow the definition of mismanaged waste outlined by Jambeck et al. (2015): "Material that is either littered or inadequately disposed."¹² Mismanaged waste typically includes uncontrolled landfills and open dumps, waste that is not collected, and waste that is littered. Thus, this value is not how much plastic enters nature, but rather a potential volume that is not adequately managed, which has the potential to enter ecosystems. We consider mismanaged plastic waste to be indicative of potential plastic leakage, as mismanaged waste can enter terrestrial environments through inadequate disposal. This waste could eventually enter freshwater environments and thus move to marine environments via inland waterways, wastewater outflows, and transport by wind or tides. Future versions of the model will aim to incorporate more direct approaches to measuring plastic leakage.

^B Future iterations of the Tracker will include composting as well, as more data becomes available regarding the prevalence of composting for plastic waste.

FIGURE 4. Example of Waste Management Model inputs and outputs



*The level of detail and accuracy for the output section will depend on:

- data that can be input
- level of granularity the assumptions can be produced to, within an agreed margin of error based on the data sources reviewed for this project

MODEL DEVELOPMENT

To develop the model, Anthesis first conducted a literature review of publicly available data sources on recycling, landfill, incineration, and mismanagement rates for plastics and constructed a country-level waste management database.¹³ Since there is currently not a complete data set available for the global flows and management of plastic waste, Anthesis used this database as a basis for developing assumptions to fill in the remaining data gaps. Advice from an expert in plastic waste management was used to fill in data gaps and inform and verify the assumption development. The identified data sources provided the following:

- **Waste management information at various levels of material.** E.g., some datasets look at all waste materials (including plastic), others at plastic waste, others at plastic packaging waste, and still others at specific formats and/or plastic resins.
- **Varying levels of completeness of waste management data for each country.** E.g., some datasets only provide information on one form of management (such as recycling), whereas others provide information for the complete set of management systems.
- **Different number of countries within the data set.** E.g., some data sets are only relevant to the European Union, and in some cases, there is information at a regional level but not for specific countries within the region.

The resulting output is tonnage by waste management outcome, both as an aggregate and for individual countries (Figure 4).

OUTPUT USE

The model builds on data provided by each company in the ReSource Footprint Tracker Company Plastic Survey to provide an output showing the waste management outcomes for their plastic packaging placed on the market. To do this, the model uses the best available published data, expert assumptions, and calculations.

Intended uses of the data

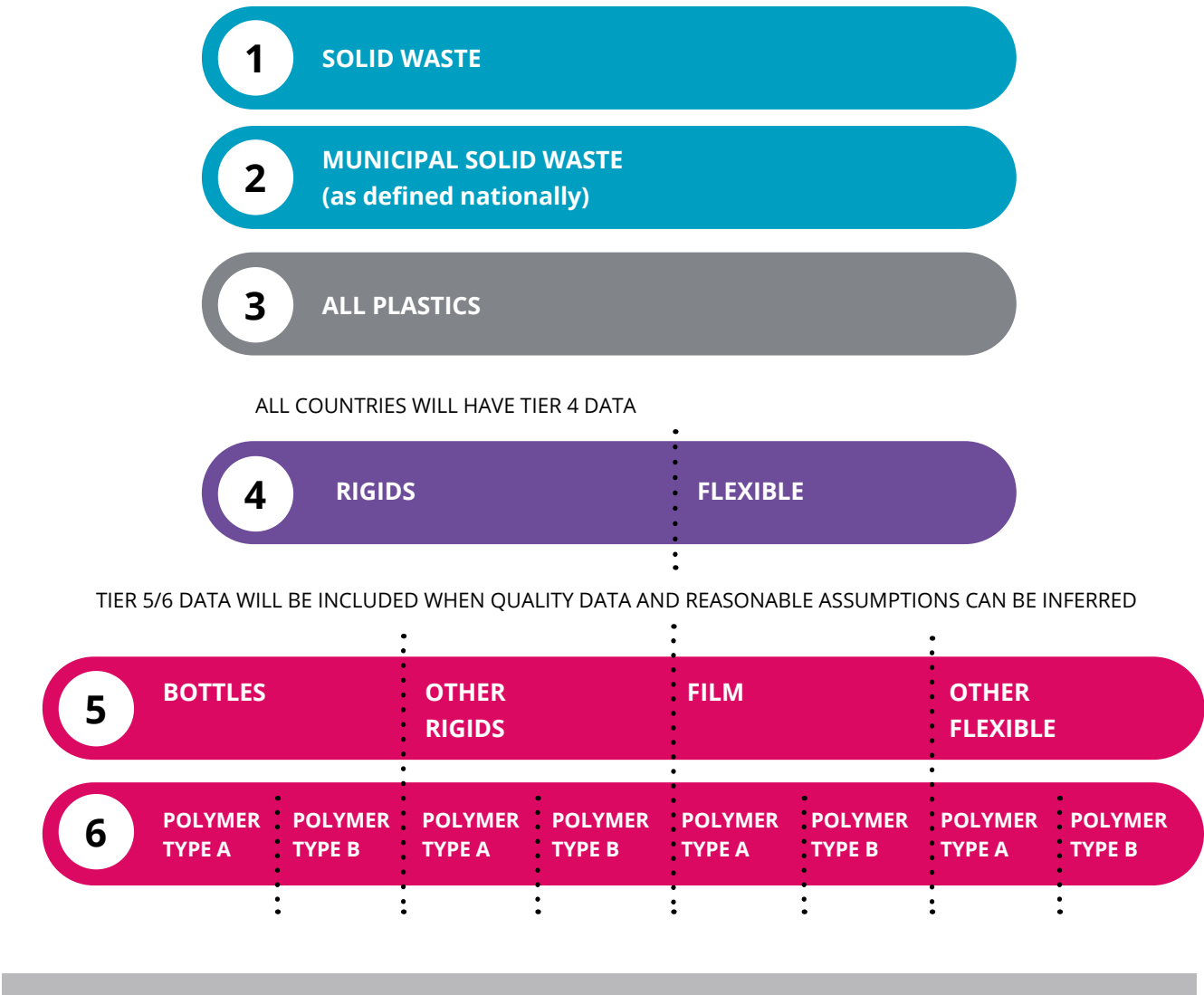
- Outputs provide an estimated overview of the waste management outcomes of plastic packaging and can help determine where further research is required.
- Outputs are a starting point to understand the global waste management outcomes of materials put on the market by different companies.
- Outputs may highlight areas where WWF and *Re-Source: Plastic* members can work together on further data gathering, material recovery efforts, innovation projects, and other Beyond Supply Chain activities.

OUTPUT INTERPRETATION

The ReSource Footprint Tracker uses the best available information, but limiting factors remain. When interpreting outputs, please consider the following limiting factors.

- The outputs should not be used as a sole basis for guiding company decisions on investment, operations, or product design, but rather used in conjunction with additional company and local context.
- Waste and recycling rates are not globally defined, and national reporting frameworks for each country differ.
 - e.g., Chemical recycling would not contribute toward recycling rates in EU member states, whereas in Japan it would count.
- It is difficult to collect reliable data for informal recycling rates; and therefore, there is higher uncertainty in countries where informal recycling is prevalent.
- Materials may be sent for recycling, but due to their design or the capabilities of the reprocessing facility, may not actually be recycled.
 - e.g., Black plastic, multi-layer film bags, paper coffee cups lined with PE
- Available data on mismanaged plastic waste is scarce. The model is primarily informed by data from Jambeck et al.,¹⁴ as well as by a detailed literature review on more recent country-level reporting meriting inclusion (e.g., World Bank's *What a Waste 2.0* study¹⁵). It is important to note that different calculation

FIGURE 5. Data tiers for identifying and reporting plastic waste management



approaches and assumptions may lead to different estimates in rates of recycling, incineration, landfill, and mismanagement at a country level. As part of our methodology development, we compared mismanagement rate estimates from Jambeck et al.,¹⁶ Lebreton and Andrady,¹⁷ and the Plastic Leak Project’s methodological guidelines,¹⁸ before finalizing our approach.

- The source data is variable in nature and at times based on studies undertaken over 10 years ago. Due to the model’s reliance upon Jambeck et al. at a country level, it may not factor in improvements made

within the waste sector achieved in the past 5–10 years. These and other data quality issues are addressed through the provision of data quality scores and flags in the model.

- Outputs do not currently account for global trade flows of plastic.

Further discussion on these points is provided later in this document.



DATA TIERS

The model uses six tiers of data with increasing specificity to identify the management of single-use plastic packaging (Figure 5), from all solid waste (Tier 1) to specific polymers and packaging forms, e.g., PET bottles (Tier 6). Tier 1 and Tier 2 refer to solid waste and municipal solid waste data, respectively, and were only used when plastic-specific data were not available. The main data source used was the World Bank's *What a Waste 2.0* report.¹⁹

The primary tiers employed in the analysis are Tier 3 All Plastics, Tier 4 Rigid/Flexibles, Tier 5 Form, and Tier 6 Form and Polymer. These tiers are outlined below:

Tier 3 All Plastics—Most reported waste management data for plastic is aggregated for all plastics (Tier 3). At this tier, country-level plastic recycling rate data is either sourced, assumed to be similar to that of a comparator country, or estimated based on Anthesis' knowledge and engagement with an external expert on secondary plastics. The model's country-level mismanagement rates are based on those estimated by Jambeck et al.²⁰ If

landfill and incineration rates specific to plastic are not available, estimates from the World Bank's *What a Waste 2.0* report²¹ are used to apportion the remaining material after accounting for recycling and mismanagement. Reported rates may be adjusted to allow for consistency across all waste management pathways (to ensure that all rates add up to 100%).

Tier 4 Rigid/Flexibles—Waste management rates for rigid and flexible plastics were calculated using the ratio of recycling rates for rigid and flexibles in Europe based on the Waste and Resource Action Programme (WRAP)²² and Deloitte Sustainability and Plastic Recyclers Europe²³ and then multiplied by the Tier 3 All Plastics recycling rates for the remaining countries. Mismanagement estimates from Jambeck et al.²⁴ are applied across all waste management tiers, meaning estimated mismanagement is currently the same for rigid and flexibles. Because the model estimates mismanagement and not leakage, it does not reflect evidence indicating that flexible plastics are more likely to leak into the environment than rigid plastics, such as Pew and SYSTEMIQ's *Breaking the Plastic*



Wave report.²⁵ This has been identified as a desired area of exploration in future versions of the model.^C All countries in the model have waste management rates for rigid and flexible plastic (Tier 4).

Tiers 5 and 6 Form and Polymer—WWF is collaborating with Wood Mackenzie, a research and consultancy group specializing in the energy, chemicals, metals, and mining industries, to provide Tier 6 PET bottle recycling rates for 89 countries across the globe.^D Beyond PET bottles, Tier 5 and 6 data is currently only available for the United States. For the United States, form-specific (Tier 5) rates are available for bottles, other rigids, and mono-material film, and form- and polymer-specific (Tier 6) rates

are available for PET, HDPE, PVC, LDPE, PP, PS, and PLA bottles and other rigids.

The model provides outputs at a combined performance level which dynamically utilizes the highest tier of data available, with the aim of providing the most granular and accurate picture of a company's performance for what materials they place on the market. For example, at this combined performance level, if management-based data for PET bottles is known, then this data will be used to calculate the outputs, while for other waste streams where management-based data is less specific, the model will apply a rigid plastics assumption.

C According to Pew and SYSTEMIQ's Breaking the Plastic Wave report, although flexible and multilayer plastic make up 59% of global plastics production, they account for 80% of the plastic leaked into the ocean. The report suggests that mismanaged flexible and multilayer plastics have higher transfer rates from terrestrial pollution and dump sites to water than mismanaged rigid plastics. This can explain why flexible and multilayer plastic are more likely to leak into the ocean than rigid plastics, however, it does not necessarily imply that flexible and multilayer plastics are more likely to be mismanaged in the first place. As the Waste Management Model estimates the percentage of plastic waste that is mismanaged rather than leaked into the ocean, mismanagement rates are currently assumed to be the same for rigid and flexible plastics.

D The data and information provided by Wood Mackenzie should not be interpreted as advice and you should not rely on it for any purpose. You may not copy or use this data and information except as expressly permitted by Wood Mackenzie in writing. To the fullest extent permitted by law, Wood Mackenzie accepts no responsibility for your use of this data and information except as specified in a written agreement you may have entered into with Wood Mackenzie for the provision of such of such data and information.

DATA AVAILABILITY

When the Waste Management Model was developed and updated by Anthesis (2019–2020), there was no global dataset covering the flows and waste management outcomes of plastic packaging to this level of detail. Therefore, Anthesis undertook a structured literature review to collate publicly available data sources that contained information on management outcomes of plastic packaging in order to develop a global reference list. This review captured both national and regional-level studies. Due to data scarcity, the literature review also started as an open search with no parameters for the quality of study undertaken. As such, the long list of

literature reviewed included a full range of sources, from academic studies to regulatory reported data. The data quality was then assessed in a two-stage process, as explained in the following sections.

When undertaking the literature review, a reference list of gaps in the literature was also collated. This identified areas where assumptions or the use of proxy data would need to be employed to provide global estimates of waste management pathways. For countries with the most limited data, advice from an expert^E in plastic packaging management was used to help fill in data gaps with estimates and inform and verify the assumption development. Anthesis and WWF worked closely on the literature review and data quality assessment protocol.

TABLE 7. Literature assessment matrix

Criteria/Score	1	2	3	4	5
Validity	Non-qualified estimate or unknown source	Qualified estimate by industry expert	Non-verified data partly based on assumptions	Verified data (compliance/regulatory data) partly based on assumptions	Verified data based on measurements for compliance/regulatory reporting
Completeness	Data covering a single source (post-consumer, post-industrial, packaging) of plastic and containing a single waste management outcome, e.g., recycling rates	Data covering all sources (post-consumer, post-industrial, packaging) of plastic, containing a single waste management outcome, e.g., recycling rates	Data covering a single source (post-consumer, post-industrial, packaging) of plastic and containing only formal waste management (recycling, incineration, landfill)	Data covering all sources (post-consumer, post-industrial, packaging) of plastic with referenced collection coverage, containing all formal waste management (recycling, incineration, landfill)	Data covering all sources (post-consumer, post-industrial, packaging) of plastic with referenced collection coverage, containing all waste management outcomes (recycling, incineration, landfill, mismanagement)
Timeliness	Older than 10 years or unknown	Data that is 7 to 10 years old	Data that is 4 to 7 years old	Data that is 2 to 4 years old	Current year or up to 1 year out of date
Consistency	One off study based on case study or less than annual timeframe	One off study based on case study with annual timeframe	Annual data available from a repeated study (2 years of data but not consecutive)	Regular data based on consistent approach available for 2 consecutive years, or published biennially	Annual data based on consistent approach available for 5+ years

Each data source was assessed in relation to the depth of data (the level of data available) and the breadth of data (the coverage of data/number of countries) the source provides.

Based on the literature review, Anthesis selected key source information to fill the selected tiers and geographical regions. A full list of sources utilized in the Waste Management Model can be found in the [Assumptions table](#).

The model is designed for assumptions to be easily updated as better information is published, and this information will be reviewed, and available updates incorporated each year prior to annual reporting.

DATA QUALITY ASSESSMENT (PHASE 1)

The literature review was supported by a structured assessment of the quality of each source's methodology and outputs. For each source, a level of confidence has been applied using a consistent approach. This approach is made up of two steps:

1. Apply a pedigree matrix to assess the robustness of each source. Table 7 outlines the pedigree matrix used, which defines a clear approach to identifying the [validity](#), [completeness](#), [timeliness](#), and [consistency](#) of each data source. This process is designed to determine the quality and robustness of the source data itself and the methodology behind its development. For example, this process captures to what extent the source data has a defined methodology that is documented and consistently applied in the collation of data for regulatory purposes or national reporting. In this assessment, each criterion is scored 1 to 5, 1 being the lowest scoring and 5 being the highest scoring, indicating a more robust source of waste management data.

2. An assessment of the source's relevance in application to a certain geography/country.

The pedigree matrix (Table 7) was used as a template to develop a literature database. All reviewed literature sources have been scored against the parameters; comments have been added to give additional information on the data source. Each reference has been given a unique reference number in order to be easily identified

within the model. In addition to the scoring, the database also includes the tier and the country to which the data directly applies.

This is important when scoring the geographical application of the data. For more details, please see the "Data Quality Assessment (Phase 2)" section.

Assumption development

Certain calculations and adjustments to referenced datasets were required in order to provide global waste management outcome estimates for Tiers 3 and 4, as well as for adjusting Tier 5 and 6 data. These calculations are consistent across the data tiers, using a three-step approach:

1. Source data has been researched and reviewed to populate data for management outcomes for recycling, landfill, and incineration rates. In most instances, data for incineration and landfilling of waste is sourced from the *What a Waste 2.0* study,²⁶ supplemented with additional plastic-specific recycling figures where available or more appropriate. For example, European Commission data is utilized to populate countries under the EU reporting framework. Where the literature review process did not identify a single source with coverage of all formal and informal management of waste (that add up to 100%), adjustments to the combined figures have to be made as per steps 2 and 3 below. In the case of multiple reported management outcomes (mainly applicable for recycling data), the most credible source was determined by Anthesis in collaboration with WWF.
2. Calculations are then applied to adjust managed waste streams (formal recycling, incineration, and landfill) to equal 100%. This is prompted by the following:
 - There was a need to merge two datasets—creating a full set of assumptions including conventional management data (recycling, landfill, incineration) and ensuring that the full set of rates equate to 100%.
 - To account for mismanaged plastic waste (e.g., waste that falls outside of the "managed" waste system), the managed plastic waste rates were adjusted downward proportionally in line with the estimated mismanagement rates from Jambeck et

al.²⁷ This was based on the assumption that mismanaged plastic is not fully accounted for in reported waste management rates. The model has been populated with flags to note when other sources, primarily Lebreton and Andrady²⁸ and Plastic Leak Project's methodological guidelines,²⁹ diverge from Jambeck et al.

3. To ensure that a company's overall results incorporate the best available data and reflect their portfolio as accurately as possible, tiers with the highest levels of reported data were prioritized during the assumption process. For example, if data was available for a country's recycling rate at Tier 6, this data is prioritized with data from lower tiers and adjusted accordingly. An example calculation is included below:

Data available

- primary source data for Tier 6: recycling rate of 70%
- calculated Tier 4 incineration rate of 20%
- calculated Tier 4 landfill rate of 10%
- calculated Tier 4 mismanagement rate of 30%

In this example, the 70% recycling rate is used with the remaining 30% apportioned between incineration, landfill, and mismanagement based on Tier 4 assumptions. If 100 tonnes of material was placed on the market, 70 tonnes would be recycled, 10 tonnes would be incinerated, 5 tonnes would be landfilled, and 15 tonnes mismanaged.

4. When data was reported at the same tier, mismanagement estimates were prioritized over the

other management outcomes. Simply put, higher tier estimates were prioritized over lower tier estimates and mismanagement estimates from Jambeck et al. were prioritized over other Tier 3 estimates.

Source of data and information for the above calculation approach:

- **Recycling**—Recycling rates are either sourced from studies and reports found as part of the literature review or assumed based on insights from a plastic market specialist. In some instances, the recycling rates are presumed to be similar to those of a comparable country or calculated based on the average performance of countries within the same national income bracket.
- **Incineration**—Incineration data is either sourced from studies and reports found as part of the literature review or drawn from the *What a Waste 2.0* study.³⁰ In certain examples, rates may be presumed to be similar to those of a comparable country or calculated based on the average performance of countries within the same national income bracket.
- **Landfill**—Landfill data is either sourced from studies and reports found as part of the literature review or drawn in from the *What a Waste 2.0* study.³¹ In certain examples, it may be presumed to be similar to that of a comparable country or calculated based on the average performance of countries within the same national income bracket.
- **Mismanagement**—Mismanagement data is available from Jambeck et al.³² for most countries with a coastline. A range of calculations have been made on the source data to help complete the assumptions database.

TABLE 8. Geographical scoring

Score	1	2	3	4	5
Geography	Source data is applied to a country purely based on geographic proximity	Source data from a regional study is applied to a country (not within the region) with similar waste management systems and regulations	Source data from a country is applied to a country with similar waste management systems and regulations	Source data from region is applied to a country from within	Source data is applied directly to a representative country
	E	D	C	B	A

- “Calculated—average rate for all Upper Middle Income Countries (UMC) where data is available or inferred from similar countries” = calculated average of other UMC income bracket countries from data sourced from Jambeck et al.
- “Calculated—average rate for all Low Income Countries (LIC) where data is available or inferred from similar countries” = calculated average of other LIC income bracket countries from data sourced from Jambeck et al.
- “Calculated—average rate for all Low and Middle Income Countries (LMC) where data is available or inferred from similar countries” = calculated average of other LMC income bracket countries from data sourced from Jambeck et al.
- “Calculated - average rate for all High-Income Countries (HIC) where data is available or inferred from similar countries” = calculated average of other HIC income bracket countries from data sourced from Jambeck et al.

DATA QUALITY ASSESSMENT (PHASE 2)

In order to determine if the source data has been applied to the country for which it was originally developed/reported, or if it has been applied to a country with missing data based on the previously defined assumptions, an additional scoring of 1–5 for geographical criteria has been added.

1. An assessment of the source’s relevance in application to a certain geography/country.

Once each source has been evaluated using the assessment matrix, a final step is required to determine how relevant the source is in its application to a specific country. In this respect, the data quality can score highly and be reported via a robust methodology, but if it is being applied to a region with limited applicability, then it will be given a low “geographic” criterion scoring. Therefore, the assessment separates the evaluation of the data quality from data application. In the assessment, a score of E refers to the application of data that is loosely applicable while the top score A refers to data that is directly applicable, e.g., collated and recorded from the country to which it is being applied (see Table 8).

The combination of the first and second data quality assessment steps provides a transparent methodology to articulate data confidence for the user. For each source utilized in the model, an associated numeric score is applied out of a maximum of 25. This accounts for all scored elements of the data assessment (validity, completeness, timeliness, consistency, and geography). Each geographic score is further translated into a letter grade from A to E and appended at the end of the numeric score. For example, two management-based assumptions may be recorded with scores of 21A or 21E. In the first instance, this would mean it has received a score of 16 for validity, completeness, timeliness, and consistency, and a 5 for geography. In the second case, the source has received a score of 20 for validity, completeness, timeliness, and consistency, and a 1 for geography.

This additional information is provided so that in the instance where a user wishes to review the assumptions in more granular detail, they can understand how a reference’s score is split between the robustness of the data quality and geographical applicability.

Where data from the literature review is adapted and/or used out of context, some additional data quality scoring changes are made:

- **Application of source data to different countries.** In instances where no direct waste management data for a specific country is available, data is incorporated from similar countries or regions based on geography or similar waste management sectors. To account for the application of another country’s data, the 1–5 scoring for geography will be reduced by the applicable number. This will enable users to identify cases where data is applied to a different country or region for which it was collected/reported. If the values are based on geographical proximity, the scoring is reduced by 1 point and the geography is set to B. Within the assumptions documents available to users, each source is, therefore, scored out of a total of 25 but appended with a geographical applicability letter from A to E.
- **Calculations using source data.** If averages of datasets, such as in the Jambeck et al. study, are used to identify reasonable assumptions for countries’ waste management data, then this will be represented by reduced scoring for the validity and geographic scoring categories. Both of these steps will be

recorded in the model's assumptions table to provide transparency as to how the data has been scored, but also with a key aim of reflecting lower scores where "good data" is not available. For example, where data is based on average income levels (based on the Jambeck study), the scoring is reduced by 3 points and set to D, as the geographical scoring is based on countries with assumed similar waste management systems and regulations, but not on geographical proximity.

- **Using lower-tier data to fill gaps at a higher tier.**

Where gaps in data exist and are required to be filled by the use of lower-tier data, e.g., having to take Tier 4 data and apply it to Tier 5 data, scoring will be consistently downgraded by 3 points. For Tier 5 and 6 the "adjusted rates" should be viewed as calculations since the data is based on Tier 4 data and adjusted to the recycling rate of Tier 5 and 6 data to equal 100%. Although the source has been collected in a robust manner, it is being applied in a different context than intended for Tiers 5 and 6. This reduction in scoring is important for flagging areas of poorer quality data for further investigation.

Uncertainties in reported data

When using the model, please consider that waste and recycling rates are not globally defined, and the national reporting frameworks of each nation differ. For example, in the UK, municipal solid waste (MSW) includes waste from households as well as similar waste streams generated at commerce, offices, public institutions, and selected municipal services that may be co-collected via local authority collection services. However, this can

differ significantly between countries. In India, MSW includes construction and demolition waste, which presents a completely different picture of recycling performance. Another example is that in the EU, chemical recycling would not contribute toward recycling, whereas in Japan, it would. This means the data for different nations is not directly comparable, as it is not possible to reliably standardize these figures through data adjustments.

It is also important to consider that

- The reported figures may not be the true management outcome of materials: Waste may be collected and sent for recycling but may be **mismanaged at export destination**. For example, the UK may report 50,000 tons of material as being sent for recycling. If some of this waste is mismanaged at point of treatment in the export country, then this is challenging to account for.
- Nationally reported figures for recycling are unlikely to include **informal activities** that contribute toward recycling. If the informal sector is extracting recyclables before the formal sector (on which reporting is based), then it is possible that the reported figures are artificially lower, as valuable materials are extracted prior to formal collections.
- Some **problematic materials** will be counted as being "sent for recycling" but will not actually be recycled (such as black plastic).

Where these potential data issues can be identified, flags are provided in the model (Figure 6).

FIGURE 6. Example of accompanying flags and context for each data output

Contextual Flags

Waste Management data has been drawn from a range of sources as well as estimated where no reference sources are available.

Where referenced data is available from reported sources, it has been used, but waste management definitions can differ from one country or region to another.

Source data utilized may not always include the benefits of activities undertaken by the informal sector.

Beyond Supply Chain Survey

The quantitative analysis of the ReSource Footprint Tracker, which examines companies' plastic portfolios and estimates likely waste management outcomes, is critical to understanding how various plastics contribute to the plastic waste issue. However, there are many activities that organizations are undertaking that aren't captured in this analysis but that may be impactful in advancing solutions that improve global material management, increase collection and recovery, and build circular systems to reduce plastic pollution. The Beyond Supply Chain Survey is intended to measure the impact of activities that contribute to the improvement of plastic waste management outside of a company's direct operations.

The Beyond Supply Chain Survey captures information on any type of collaboration that works to make changes to the landscape as a whole and is not solely focused on a company's own supply chain. This helps with development of an understanding of the scope and locations of such projects, as well as their potential and actual impact. WWF encourages reporting for all current projects with which a company is involved. Examples include collection programs such as municipal incentive programs or reverse vending machines, education and outreach campaigns, infrastructure development, investment through third parties (e.g., Closed Loop Fund), R&D, collaboration with entrepreneurs, or place-based programs. Beyond Supply Chain data will not be integrated with quantitative data collected by the Company Plastic Survey. However, this information can be paired with quantitative information about plastic waste management within a company's portfolio to employ a systems thinking approach and inform mitigation strategies.

The first version of the Beyond Supply Chain survey is an Excel-based survey developed by ERG (Eastern Research Group, Inc.), with review and input from World Wildlife Fund, key thought partners, and member companies in Fall 2019. The Beyond Supply Chain survey was not included in the 2019 Tracker pilot, but the survey was streamlined and simplified in 2020 before being integrated into the web tool. WWF and member companies will continue improving data collection and alignment

with applicable third-party initiatives for the Beyond Supply Chain survey as relevant in upcoming reporting cycles.

Tracker Web Tool

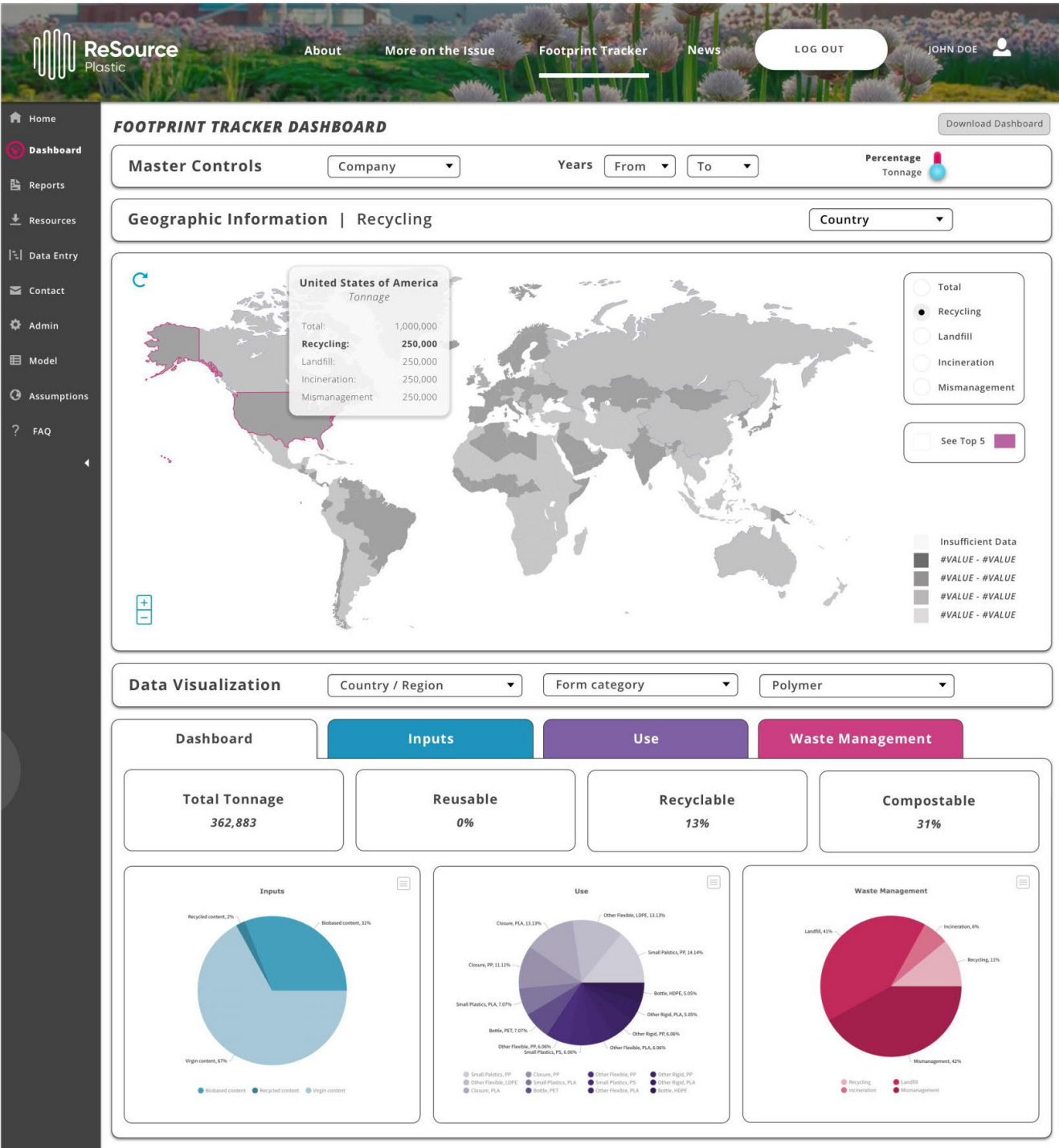
Since 2020, WWF has worked with Fuel Digital, a digital consulting firm, to develop a web-based version of the ReSource Footprint Tracker. The web tool was launched in 2021 and now serves as the reporting mechanism for both *ReSource: Plastic* and the U.S. Plastics Pact.

The web tool collects data from users, conducts the waste management model calculations, and displays the results on an interactive dashboard. Users can complete and submit the Reporting Information form and Beyond Supply Chain survey directly in the web tool and upload the completed Company Plastic Survey Excel file. Once the data has been submitted and reviewed by WWF, users can view their results on an interactive dashboard that displays their plastic footprint and waste management outcomes on a world map, as well as charts and tables summarizing the breakdown of their portfolio that can be filtered by country, form, or polymer (Figure 7). Users can either download customized visuals and data tables directly from the dashboard or choose from a set of standardized report templates.

Only members of *ReSource: Plastic* or the U.S. Plastics Pact have access to the full functionality of the web tool. Other users can use the site to access resources such as methodology and guidance documents, look up all the assumptions and data sources used in the waste management model, and view a sample dashboard illustrating the functionality of the tool.

The web tool can be accessed at <https://resource-plastic.com/footprint-tracker>.

FIGURE 7. ReSource Footprint Tracker interactive dashboard







Tracker Analysis & Interpretation

The ReSource Footprint Tracker results produce an overview of plastic packaging for a company's global operations, highlight areas where further information is needed, and identify potential collaboration opportunities for data gathering, responsible sourcing, plastic recycling and composting, product design and business model innovation, and infrastructure improvements.

These results are framed against *ReSource: Plastic's* three goals of: eliminating unnecessary plastic; switching to sustainable inputs for the remaining plastic; and doubling global recycling and composting of plastic. Based on the results of the portfolio and waste management analysis, several outputs emerge, including the identification of highly used plastic products (both by polymer type and form) and priority countries with high landfill and/or high mismanagement tonnages.

Any analysis of the Tracker results should account for data assumptions and limitations, as outlined in previous sections. In this current iteration of the methodology, the Tracker results primarily reflect

- the portfolio of member companies in terms of polymer sourcing and forms of plastic sold (where did the plastic come from, what kind of plastic is it, and what is it used for?)
- the estimated waste management practices in countries of sale (where the plastic is sold, how it is managed once it is used?)

Because the Waste Management Model results are heavily influenced by the specific forms in a company's portfolio and the countries they operate in, which will vary significantly from company to company and across industries, it is difficult to benchmark or compare companies across industries. For example, PET bottles generally have higher recycling rates than most other plastic forms, so one would expect the waste management outcomes for the beverage sector to differ from, for example, the restaurant sector. Similarly, a company that only operates in Europe or North America would be expected to have different waste management outcomes than a company in the same sector that operates in regions with higher rates of mismanagement.

The results should currently **not** be used as the sole basis for decisions regarding investment, operations, or product design, but can help inform a company's wider thinking on overall strategy, as well as priority areas for further investigation. It is also important to acknowledge that while the results help identify global hotspots for mismanagement and landfilling of plastics, due to the limitations of waste management data globally, these estimates involve several layers of assumptions, and in some cases, data which is several years old. Therefore, additional data collection in "high mismanagement" risk countries must be done as a part of mitigation efforts.

In order to achieve a vision of No Plastics in Nature, reporting on plastic use and management must become the norm for companies and governments. Building meaningful strategies to reduce plastic pollution

requires an understanding of how much is produced and sold, in what format, and how it is managed afterward. Increased reporting of plastic portfolios through a standardized methodology, which the ReSource Footprint Tracker aims to achieve, will bolster transparency.

But critical gaps in national-level data from governments continue to impede this ambitious effort. Simply put, we can't manage what we can't measure. Improvements in waste management data at country, state, and city levels will enable us to understand the greatest opportunities for intervention. In India, for example, urban waste recycling

has the potential to decrease landfill waste by 70%.³³

Understanding the informal sector's contribution to the recycling process can inform more impactful interventions and help ensure collaborations are inclusive and responsive to their needs. If companies, governments, and other stakeholder groups continue to advocate for and implement action on these areas, the Tracker will reflect more representative and accurate data of plastic use and management, enabling more robust analysis that supports broader conclusions. Most importantly, improvements in data quality will support more meaningful and targeted mitigation actions.





Looking Ahead

As part of the effort to strengthen transparency into corporate action on plastic, *ReSource: Plastic* releases an annual public report on individual and aggregate member plastic footprints. It includes an analysis of Tracker results and targeted recommendations for corporate action in the year ahead. As part of this process, all companies complete a baseline footprint assessment in year one of membership, and report on progress against this baseline in subsequent years.

The ReSource Footprint Tracker methodology will undergo updates and improvements based on learnings from the pilot year. In upcoming reporting years, WWF will work with *ReSource* members to standardize (and where relevant, expand) the scope of operations that companies report on, ensure consistency in data gathering processes and methods for inputting or extrapolating to fill data gaps, and apply best practices identified in this report. Part of the expanded reporting scope will include distinguishing between internally managed plastic waste and consumer-facing packaging. As companies are able to expand their scope of analysis, both in terms of coverage of operations and packaging, we will make the necessary normalization changes to more accurately track progress from year to year, or update the baseline with the modified scope of operations.

In spring 2021, WWF will launch a web-based version of the ReSource Footprint Tracker to enable real-time user access and analysis.

For Waste Management Model maintenance, WWF will update the database as new information on plastic waste management becomes available. The priorities will be improving data confidence for all plastics (Tier 3) and rigids/flexibles (Tier 4) estimates globally, particularly in regions that currently rely on assumptions and proxy data, and better coverage of form- and polymer-specific data (Tiers 5 and 6), particularly in regions that have high volumes for *ReSource* members and high estimated mismanaged volumes. A longer-term goal is to integrate global trade flows of plastic waste into the model.

We are also working to align with and/or integrate related corporate reporting efforts, including the Plastic Leak Project, the US Plastics Pact, and the New Plastics Economy Global Commitment, among others.

Reporting on plastic use and pollution is a dynamic space, with many different stakeholders working to define improvements in data, consistency in reporting, and measurement protocols for Beyond Supply Chain mitigation activities. We also hope to engage new industries through *ReSource*, which may necessitate additional methodology changes that we can't anticipate at this time. We will review this methodology annually to ensure it reflects the best available data and will provide an annual methodology update to ensure that the approach is transparent.





Appendix

Glossary

Advanced Materials

Advanced products are those that are sustainably produced, mitigate climate change, and reduce the risk of fossil depletion. This term typically captures future materials innovations that are currently in the design stage or at a very small scale. We align with the Roundtable for Sustainable Biomaterials' Advanced Products Standard.

Bottle

A bottle is a form of rigid packaging having a comparatively narrow neck or mouth with a closure and usually no handle.

Source: ISO 21067: 2007

Closure

Closures include caps and closures that would be left on containers going to recycling. Caps/closures that would be disposed separately from the primary container would fall under small plastics (problematic to recycle as separate components due to size).

Compostable

Packaging or a packaging component is compostable if it is in compliance with relevant international compostability standards and if its successful post-consumer collection, (sorting), and composting are proven to work in practice and at scale.

Source: New Plastics Economy Global Plastics Commitment

Durable Product

Durable goods are products with a life span of three years or more.

Source: US Environmental Protection Agency

Mismanaged Waste

We follow the definition of mismanaged waste outlined by Jambeck et al.: "Material that is either littered or inadequately disposed." Mismanaged waste typically includes unspecified landfills and open dumps, waste that is not collected, and waste that is littered. Thus, this value is not how much plastic enters the ocean, but rather a potential volume that is not adequately managed, which has the potential to enter ecosystems.

Mono-material Film

Mono-material film is a flexible material containing only one polymer and no non-plastic materials and which is not multilayered. It includes mono-material stretch and shrink films and mono-material film bags and sacks that are suited for recycling.

Shrink Film

Shrink film is a plastic material that shrinks in size when heated to conform to the item(s) packaged.

Source: ISO 21067: 2016.

Stretch Wrap

Stretch wrap is a material that elongates when applied under tension and which, through elastic recovery, conforms to item(s) packaged.

Source: ISO 21067:2016.

Other Flexible

Other flexible includes multi-material/laminate films.

Other Rigid

The “other rigid” category is used to capture rigids that are not classified as bottles, closures, foamed rigids, or small plastics.

Recyclable

Packaging or a packaging component is recyclable if its successful post-consumer collection, sorting, and recycling are proven to work in practice and at scale. A package is considered recyclable if its main packaging components, together representing greater than 95% of the entire packaging weight, are recyclable according to this definition, and if the remaining minor components are compatible with the recycling process and do not hinder the recyclability of the main components.

Source: New Plastics Economy Global Plastics Commitment

Recycled Content

Recycled content is post-consumer recycled content and does not include pre-consumer recycled content.

- Post-consumer recycled content is defined as the proportion, by mass, of post-consumer recycled material in a product or packaging.
- Pre-consumer recycled content is defined as material diverted from the waste stream during a manufacturing process.

Source: ISO 14021:2016

Responsibly Sourced Biobased Content

Responsibly sourced biobased content is, at a minimum

1. legally sourced
2. derived from renewable biomass and must pose no adverse impacts on food security
3. does not have negative impact on land conversion, deforestation, or critical ecosystems
4. must provide environmental benefits

Credible certifications such as the Roundtable on Sustainable Biomaterials certification can help ensure responsible sourcing. Together, we consider responsibly sourced biobased content and post-consumer recycled content as constituting sustainable plastic inputs.

Source: Bioplastics Feedstock Alliance (<https://bioplasticfeedstockalliance.org/>)

Rigid Foam

Forms under the “rigid foam” category include rigid products made from foamed polymers, typically polystyrene (PS).

Small Plastics

Small plastics are items smaller than 2 inches in two dimensions that require testing to determine the appropriate APR recyclability category.

Source: The Association of Plastic Recyclers (https://plasticsrecycling.org/images/pdf/design-guide/Full_APR_Design_Guide.pdf)

Sustainable Plastic Inputs

Sustainable plastic inputs as referred to throughout this report include recycled content, responsibly sourced biobased content, and advanced materials.

Unnecessary Plastic

Unnecessary plastic is plastic that, if not used, would not create adverse environmental or social trade-offs—related to, for example, energy use, food waste, or quality of life.

Polymer Classification	
List of Polymers for Single-Use Plastics	Abbreviation
Acrylonitrile-butadiene-styrene copolymer	ABS
Ethylene vinyl alcohol	EVOH
High-density polyethylene	HDPE
Low-density polyethylene	LDPE
Linear low-density polyethylene	LLDPE
Nylon	Nylon
Other (please specify in description)	Other
Polybutylene adipate terephthalate	PBAT
Polybutylene succinate	PBS
Polybutylene succinate adipate	PBSA
Polycarbonate	PC
Polyethylene furanoate	PEF
Polyethylene terephthalate	PET
Polyethylene terephthalate glycol	PETG
Polyhydroxyalkanoate	PHA
Polylactic acid	PLA
Polypropylene	PP
Polystyrene	PS
Polyvinyl chloride	PVC
Polyvinyl alcohol	PVOH

End Notes

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