



Tutorial

National Guidance for Plastic Pollution Hotspotting and Shaping Action

September 2021

Presented by



Guiding line

- 1 Introduction
- 2 The Core
- 3 The Complexity
- 4 Glossary and Appendix

① Introduction



The National Guidance and The Tutorial

What

This document is a **tutorial** of the “National Guidance for Plastic Pollution Hotspotting and Shaping Action” which aims at understanding the plastic pollution problem by answering 3 overarching questions:

Where to act? What to do? How to do it?

Why

The **Guidance** consists of a set of 9 interconnected modules (explanatory material to follow the successive steps) and more than 20 tools to help you generate a dataset to identify plastic pollution hotspots.

This tutorial has been created to assist a **new user** of the Guidance into getting started. The Guidance needs to be used by individuals with adequate technical background. The data results generated by following this tutorial then can be used by a wider group of stakeholders to shape **action**.

Who

The tutorial is intended as a **first approach** to the Guidance’s complexity for a new user who wants to apply its methodology of plastic footprinting to generate a complete hotspot assessment.

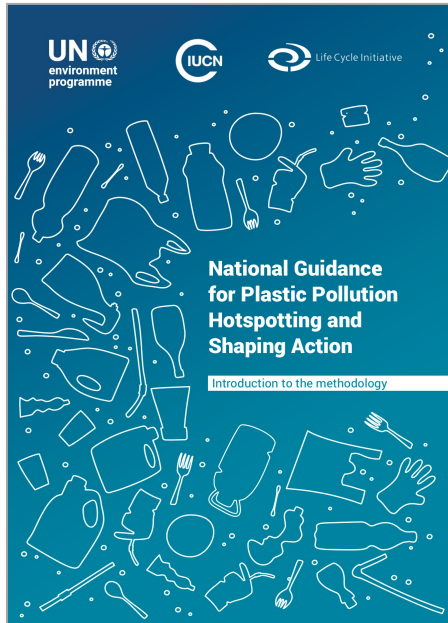
Prerequisites for the use of the Guidance Core: competencies in data collection and analysis, proficient use of Excel and basic knowledge of Python are mandatory. Note, for the Complexity element: proficiency in Python and GIS is required.

How

The tutorial is a **step by step** guide – text, schemes and video tutorials - for the application of the Guidance. It guides the user through hotspotting assessment through a linear workflow.

All the detailed information are available in the modules – together with the calculation tools – at <https://plastichotspotting.lifecycleinitiative.org/modules/>

The National Guidance – The Structure

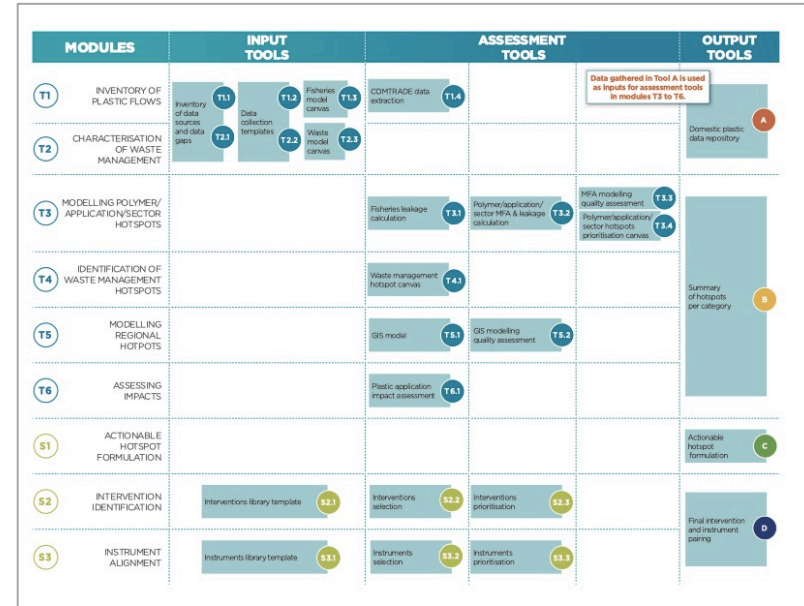


The Guidance is a combination of steps and tools organized in different modules.

These cover different aspects of data collection, data modelling and action identification.

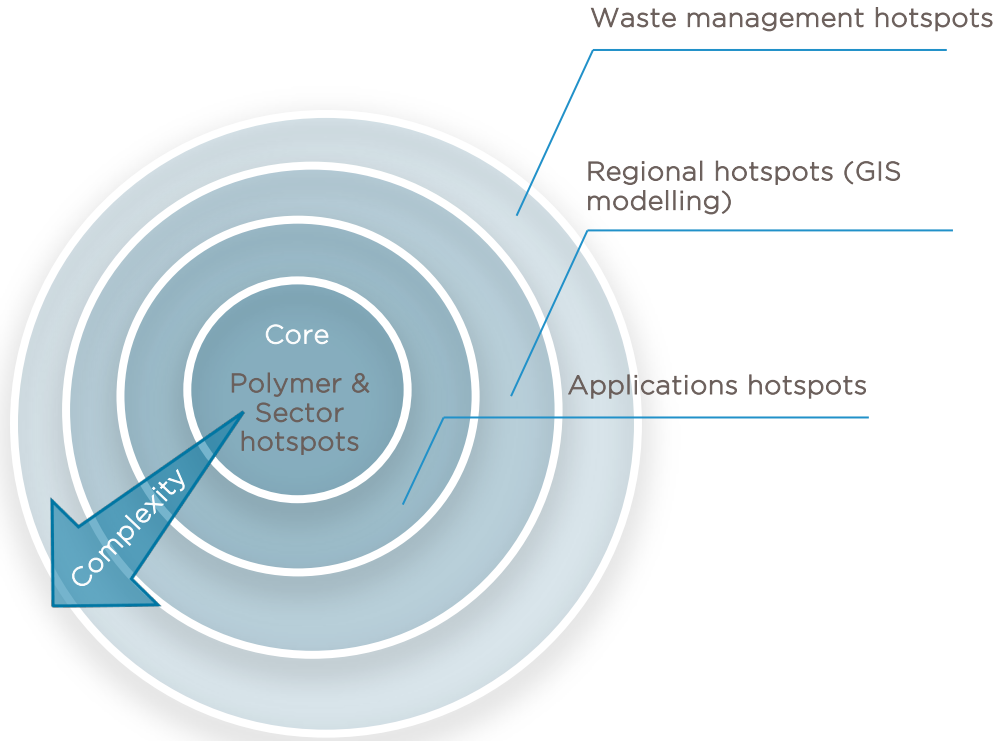
All the tools are interconnected and this is why in the tutorial we propose a **step by step approach** that focuses on a “core” – basic - assessment.

The Guidance: Modules and Tools matrix



We describe in detail **the least amount of work** that the user can do in order to obtain a **basic level of plastic pollution hotspotting**. One can then add layers of complexity to cover the full Guidance or just a part of it depending on the needs.

The National Guidance – The Structure



Differentiation between Core and Complexity

The Guidance's **structure** can be seen as a series of **layers** (onion architecture) on top of a main **core** which is the assessment of the **polymer and sector hotspots**.

The core can be considered as a **baseline** for the plastic footprint of a country.

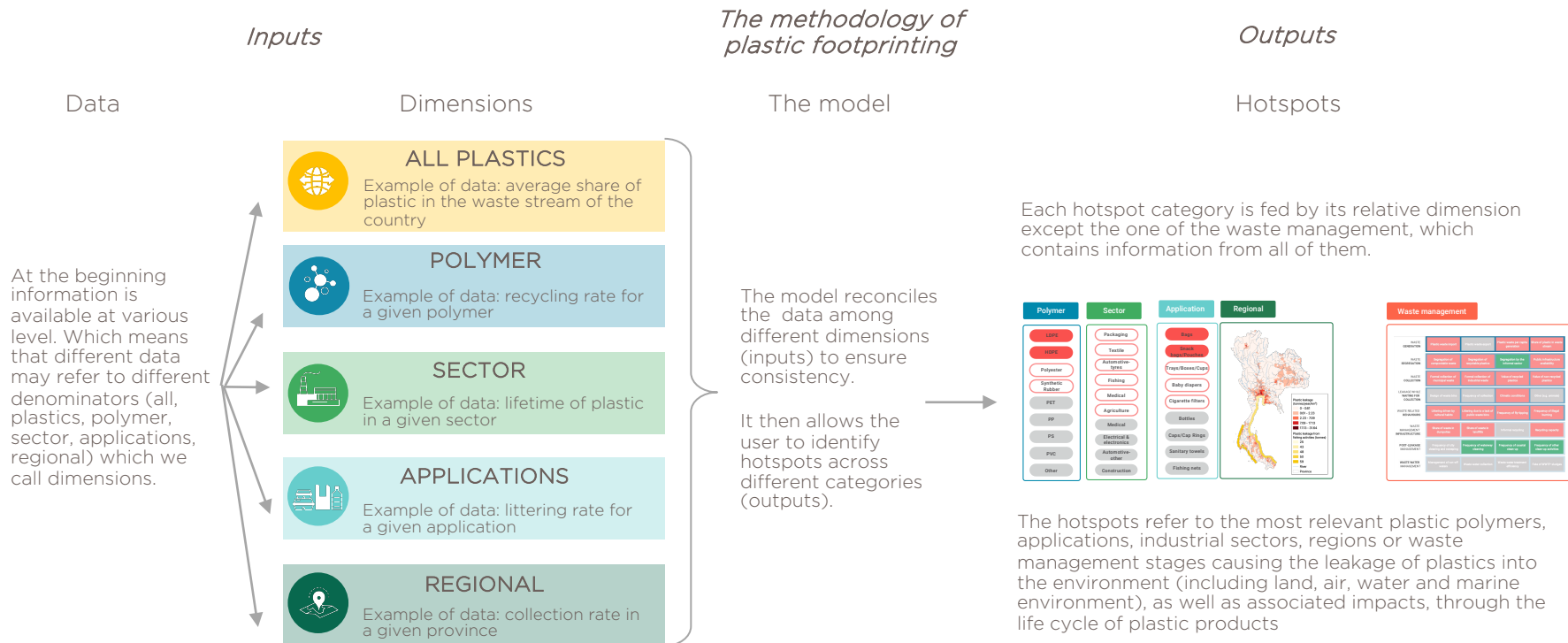
Each layer then adds **complexity** (in terms of results but also technical skills and amount of data required).

The Guidance also allows to identify **application** hotspots and specific locations (**regional** hotspots).

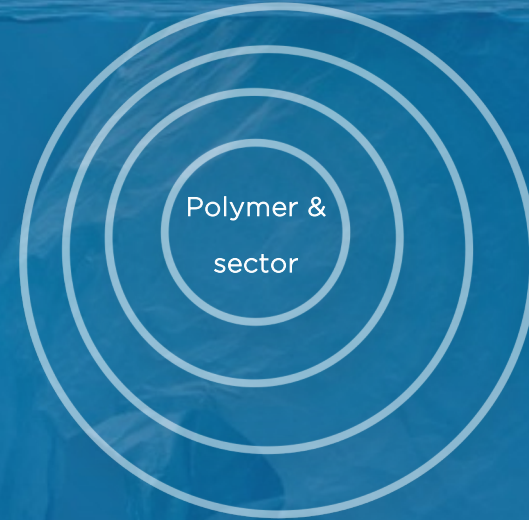
Moreover it is possible to understand which actions targeting **waste management** could be taken to solve the problem (waste management hotspots).

The National Guidance – Hotspots and Dimensions

The results seen in the hotspots analysis derive from the collection and modelling of data which refer to various categories. Those categories, indicated here as “dimensions”, represent the level at which the information is available.



② The core



The Tutorial – The Core

Linearization of the methodology and requirements

In order to visualize the journey that the user will do the tutorial is a linearization of the steps of the plastic footprint methodology.

Fundamentals

In this section the various dimensions in which the analysis takes place and their interconnections are listed and defined.

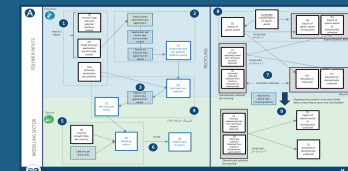
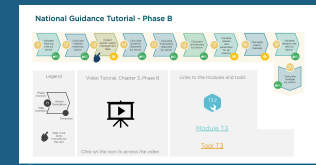
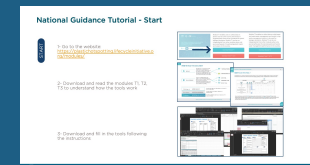
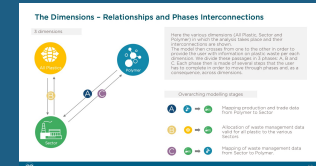
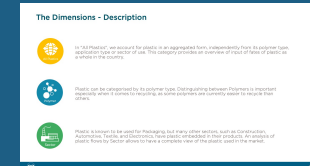
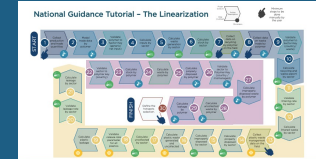
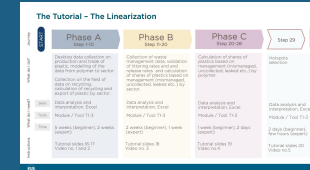
Step by step description

In this section the user is guided through each step of the methodology core with the help of explanatory videos and links to the tools.

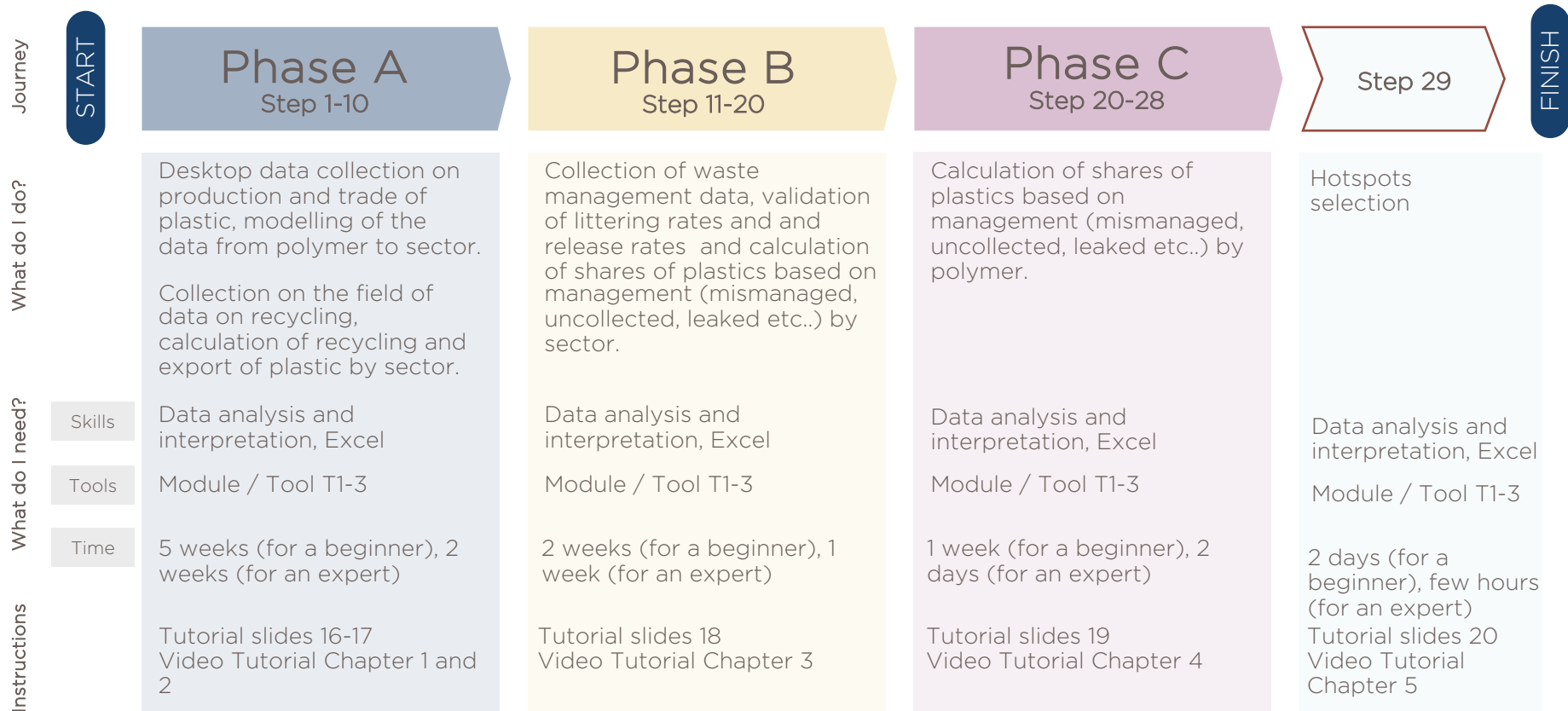
Detailed calculation routes

Detailed flowchart of each phase (A, B and C) that illustrates the links between dimensions following the steps previously listed.

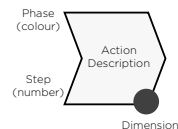
In this section of the tutorial the reader will find:



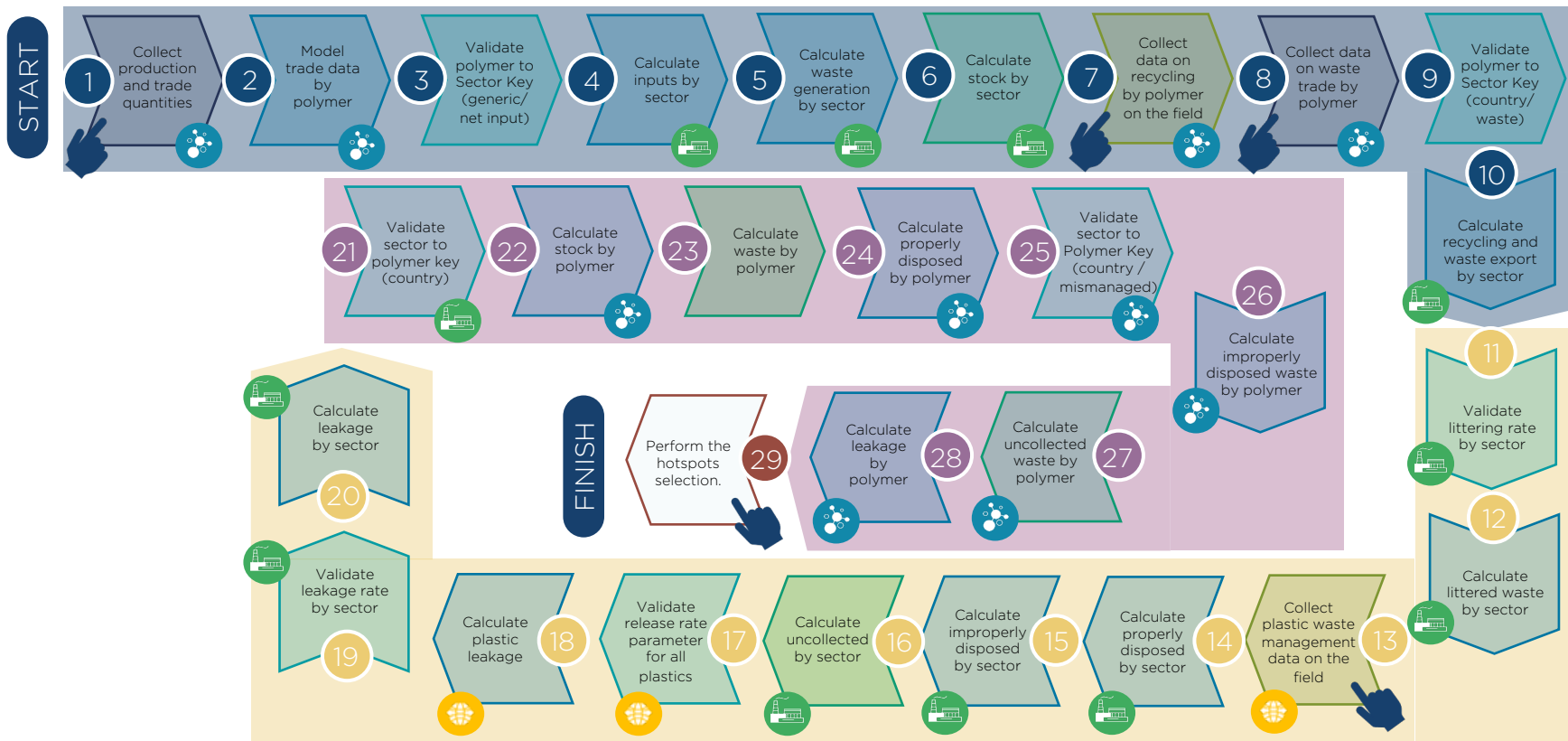
The Tutorial – The Phases



National Guidance Tutorial – The Steps



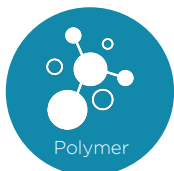
Steps that require the user to take action (input data, select hotspot)



The Dimensions - Description



"All Plastics", accounts for plastic in an aggregated form, independently from its polymer type, application type or sector of use. This category provides an overview of input of fates of plastic as a whole in the country.



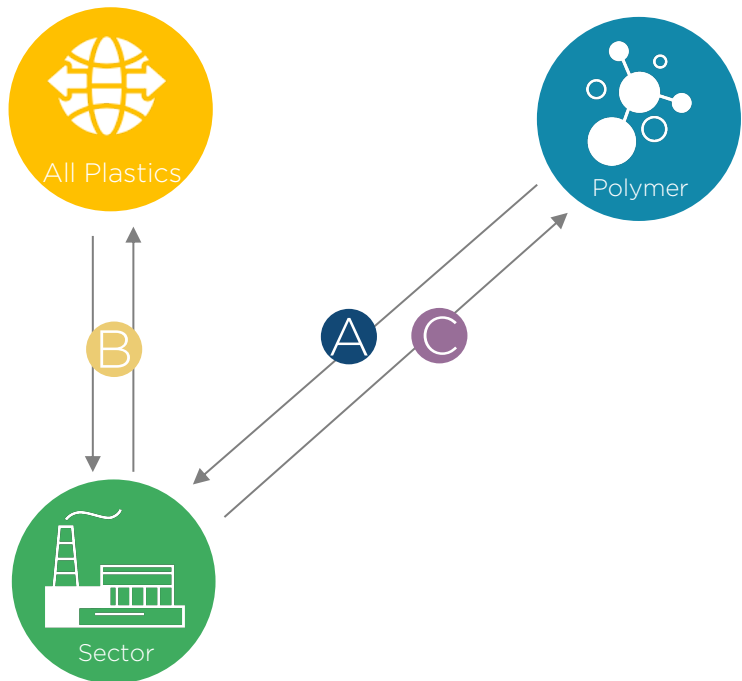
Plastic can be categorised by its polymer type. Distinguishing between Polymers is important especially when it comes to recycling, as some polymers are currently easier to recycle than others.



Plastic is known to be used for Packaging, but many other sectors, such as Construction, Automotive, Textile, and Electronics, have plastic embedded in their products. An analysis of plastic flows by Sector allows to have a complete view of the plastic used in the market.

The Dimensions – Relationships and Phases Interconnections

3 dimensions



Here the various dimensions (All Plastic, Sector and Polymer) in which the analysis takes place and their interconnections are shown.

The model then crosses from one to the other in order to provide the user with information on plastic waste per each dimension. We divide these passages in 3 phases: A, B and C. Each phase then is made of several steps that the user has to complete in order to move through phases and, as a consequence, across dimensions.

Overarching modelling stages

A



Mapping production and trade data from Polymer to Sector

B




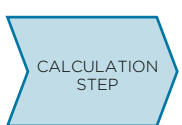
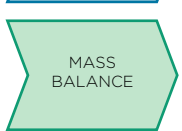

Allocation of waste management data valid for all plastic to the various Sectors

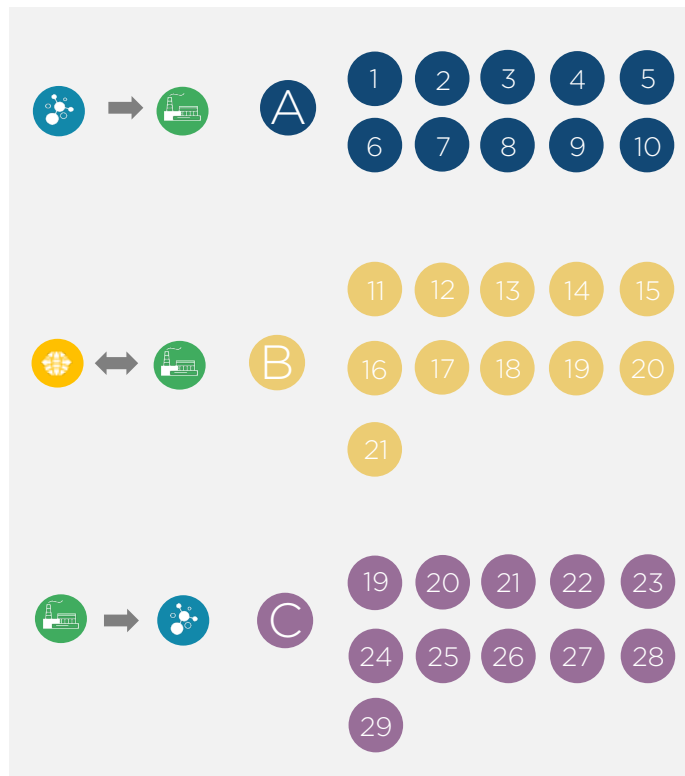
C



Mapping of waste management data from Sector to Polymer.

The steps – Description and Relationship with the Phases

 <p>ONLINE DATA COLLECTION</p>	<p>Desktop data collection refers to collection of data from known databases available online and cited in the Guidance (pg. 38).</p>
 <p>FIELD DATA COLLECTION</p>	<p>When the information is not available in an aggregated fashion within a single database for all countries, then country-specific research must be conducted. We call this “Field data collection”. Often it requires having contact in the country in order to access valuable data, but in some fortunate cases online research of the available literature can suffice.</p>
 <p>VALIDATION STEP Keys and parameters</p>	<p>The methodology outlined in the Guidance makes use of some keys (linear maps in mathematical terms) to present coherent picture of the analysis across dimensions. These keys are created starting from general keys valid for the global market and based on literature review of the project team. They need to be adjusted by the user to generate results closer to the local context. This is called validation step.</p>
 <p>CALCULATION STEP</p>	<p>Refers to a calculation or modelling step of the Guidance. Modelling steps are outlined here in the flowcharts, for an in-depth understanding access Modules 1 and 3 and Tools T1.4 and T3.2 of the Guidance, available at: link.</p>
 <p>MASS BALANCE</p>	<p>Indicates a quantity that is obtained through mass balance.</p>
	<p>This sign indicates the minimum number of steps that require the user to take action in order to obtain results (e.g input data, select hotspot). The validation steps also require action by the user, but they are meant for advance users that might want to adapt the model's keys to a local context.</p>



National Guidance Tutorial - Start

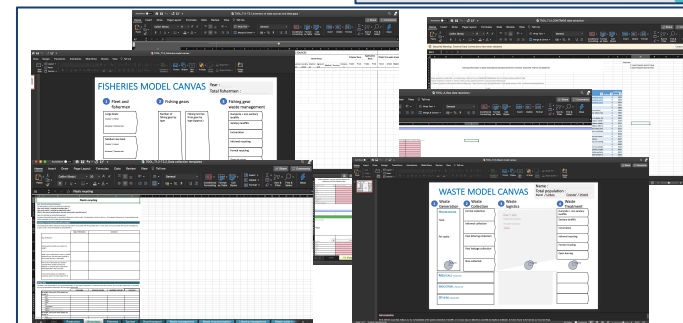
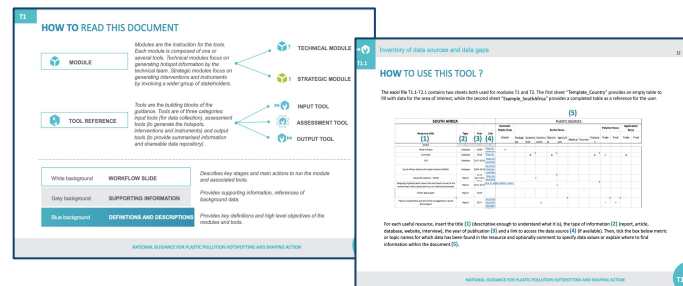
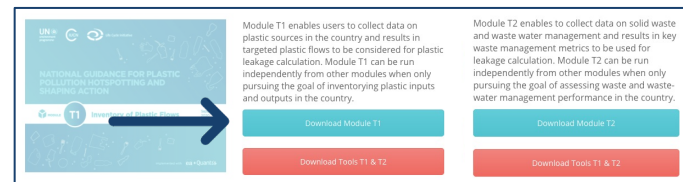
START

1- Go to the website:

<https://plastic hotspotting.lifecycleinitiative.org/modules/>

2- Download and read the modules T1, T2, T3 to understand how the tools work

3- Download and fill in the tools following the instructions

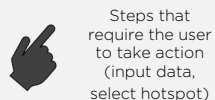
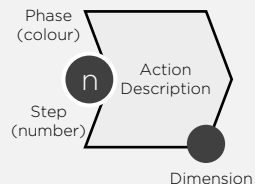


National Guidance Tutorial – Phase A, part 1/2

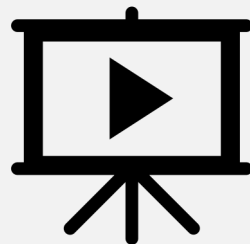
Data collection, modelling from polymer to sector



Legend



Video Tutorial, Chapter 1, Phase A 1/2



Click on [here](#) to access the video

Links to the modules and tools

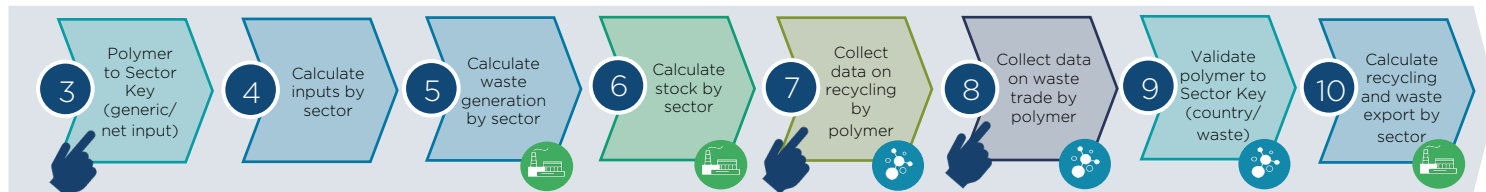


[Module T1](#)

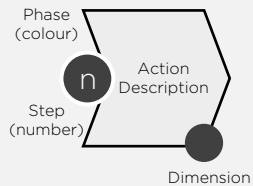
[Tool T1](#), [Tool T3](#)

National Guidance Tutorial – Phase A, part 2/2

Data collection on recycling, calculation recycling and export

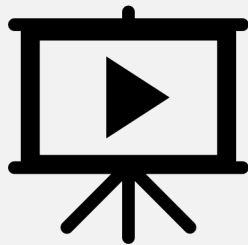


Legend



Steps that require the user to take action (input data, select hotspot)

Video Tutorial, Chapter 2, Phase A 2/2



Click [here](#) to access the video

Links to the modules and tools

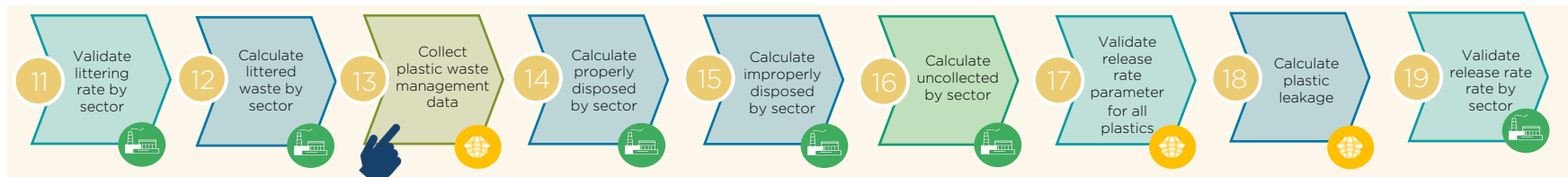


Module T3

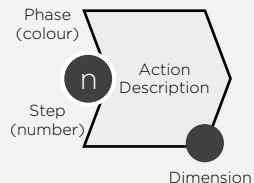
Tool T3


National Guidance Tutorial – Phase B

Waste management data, littering and release rates

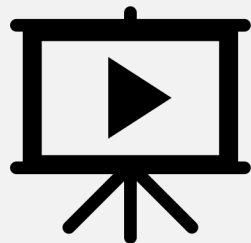


Legend



 Steps that require the user to take action (input data, select hotspot)

Video Tutorial, Chapter 3, Phase B



Click [here](#) to access the video

Links to the modules and tools

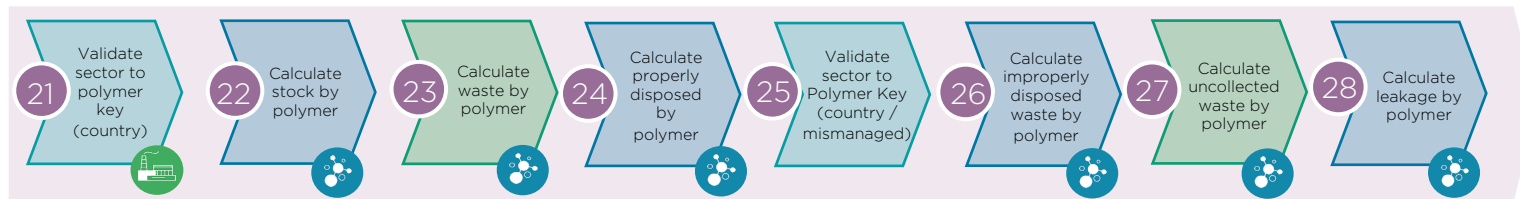


Module T3

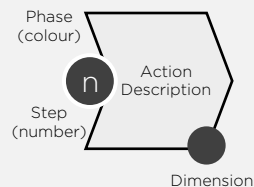
Tool T3


National Guidance Tutorial – Phase C

Shares of plastics based on management by polymer



Legend



 Steps that require the user to take action (input data, select hotspot)

Video Tutorial, Chapter 4, Phase C



Click [here](#) to access the video

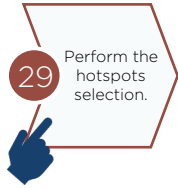
Links to the modules and tools



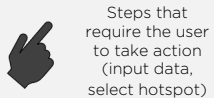
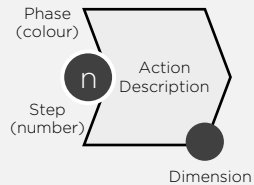
[Module T3](#)

[Tool T3](#)

National Guidance Tutorial - Hotspots Selection



Legend



Steps that
require the user
to take action
(input data,
select hotspot)

Video Tutorial, Chapter 5, Hotspots



Click [here](#) to access the video

Links to the modules and tools



[Module T3](#)

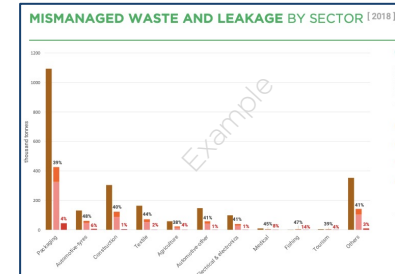
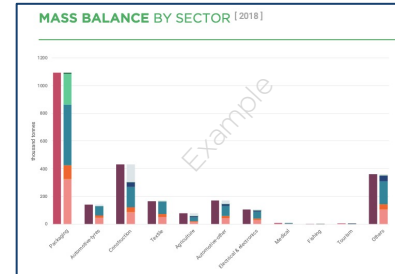
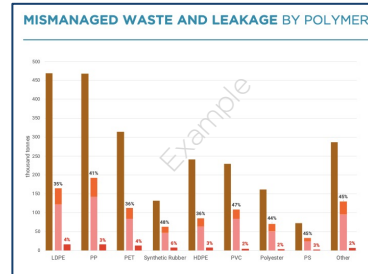
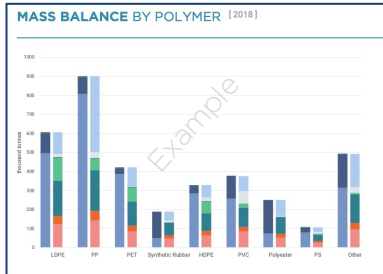
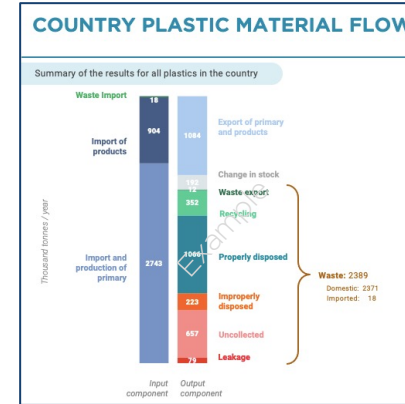
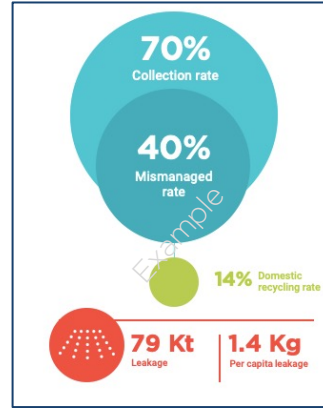
[Tool T3](#)

National Guidance Tutorial - The finish line

FINISH

Collect the results in a presentation

(The graphs are direct outputs of the tool T3)



Tips and Tricks – Things to Pay Attention to

Applying the Guidance to calculate the Plastic Footprint of your country means collecting large amounts of data, doing some calculations and reporting the results.

When doing all these operations, human errors are possible. In order to yield reliable and meaningful results, one has to check from time to time that the numbers make actual sense. There are some points in the process* where mistakes can easily happen and here is a list of what to pay attention to:

A

The “Net input by polymer” needs to be a positive number (tool T3.2, “polymer output” sheet)
Verify that “Formally collected for recycling”+ “Informally collected from streets or dumpsites by waste-pickers for recycling” is equal to “Export of plastic waste” + “Recycled of domestically collected” in both dimensions (sector and polymer)

B

The “Uncollected” needs to be a positive number (both for All Plastic and Sector).
One could also compare the total waste generated with the waste generation values reported in global databases (e.g. the World Bank “What a Waste 2.0”)
Check that the properly disposed by sector matched with available data of waste disposal by sector.
If MWI values are much higher than global database’s values, verify that industrial waste was accounted for.

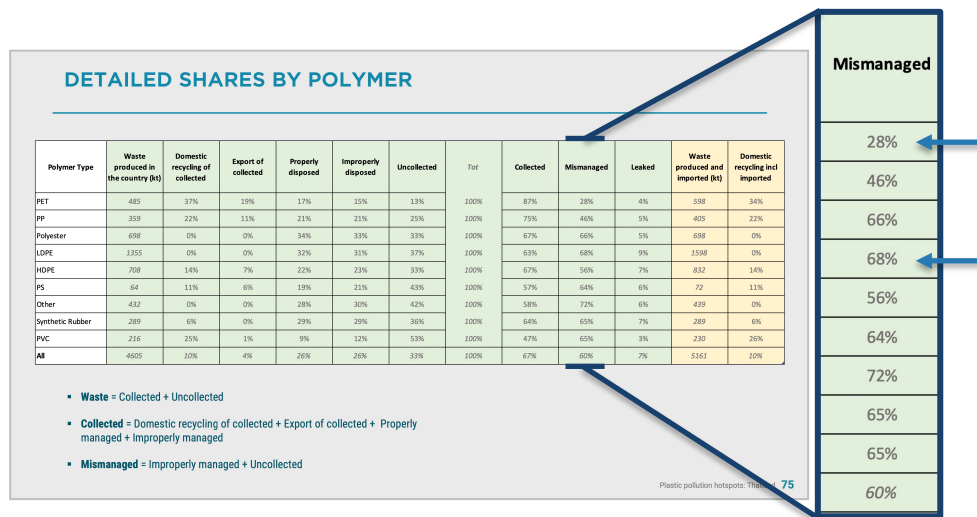
C

The “Waste by polymer”, “Properly disposed” by polymer, “Uncollected by polymer” need to be positive numbers.
Calculating the “Properly disposed by polymer”, one should compare the obtained values with the waste characterization studies at landfill.

*These are indicated as “data check” and “sanity check” in slides 35-37

What you will get by applying the tutorial ?

This is a typical example of the result of the Core analysis, a plastic data baseline by polymer type:



This information is the basis for a **science based approach** to solving plastic pollution.

It allows the user to **identify hotspots**, set **priorities** for action (interventions & instruments) and **monitor progress** at polymer level.

The **mismanaged waste index (MWI)**, which is key to eventually compute **leakage** to waterways and the **Ocean**, can be very different from one polymer to the other.

Hence the need to **assess mismanagement** at polymer level → this tutorial explains how to do it.

This is an example for Thailand; full information about this dataset can be downloaded [here](#).

③ The complexity



The Tutorial – The Complexity

Requirements

In this section the user can find what is needed to implement the layers of complexity on top of the core. The requirements and the estimated times are also listed.

Applications

The user will find in this section the same linearization of the methodology and the place to include the applications steps.

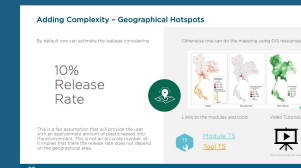
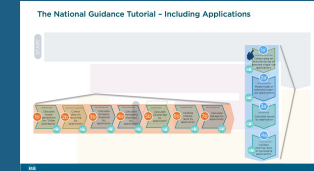
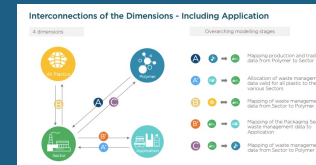
Regional hotspots

In this section the user will find the instructions on how to add the geographical assessment.

Waste management

In this section the user will find instructions on how to perform a qualitative assessment of the waste management.

In this section of the tutorial the reader will find:

[illegible]

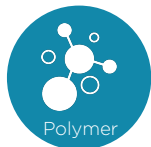
The Tutorial – The Complexity

Layer		Application	Waste Management	Regional
What do I do?		Collection of data on recycling and manufacturing by application. Calculation of shares of plastics based on management (mismanaged, uncollected, leaked etc..) by application	Data collection and interpretation on the impact that waste management practices have on the plastic leakage in the environment.	Mapping of the waste generate, leakages and collected waste by geographical archetype using GIS software.
What do I need?	Skills	Data analysis and interpretation, Excel	Data analysis and interpretation, Excel	Data analysis and interpretation, Excel, Python, mapping software knowledge
	Tools	Module / Tool T1-3	Module / Tool T4	Module / Tool T5
	Time	2 days (for a beginner), few hours (for an expert)	2 days (for a beginner), few hours (for an expert)	1 week (for a beginner), 2 days (for an expert)
Instructions		Tutorial slides 28-29	Tutorial slide 31	Tutorial slides 30 Video Tutorial Chapter 6

The Dimensions – Including Application



In “All Plastics”, we account for plastic in an aggregated form, independently from its polymer type, application type or sector of use. This category provides an overview of input of fates of plastic as a whole in the country.



Plastic can be categorised by its polymer type. Distinguishing between Polymers is important especially when it comes to recycling, as some polymers are currently more recycled than others.



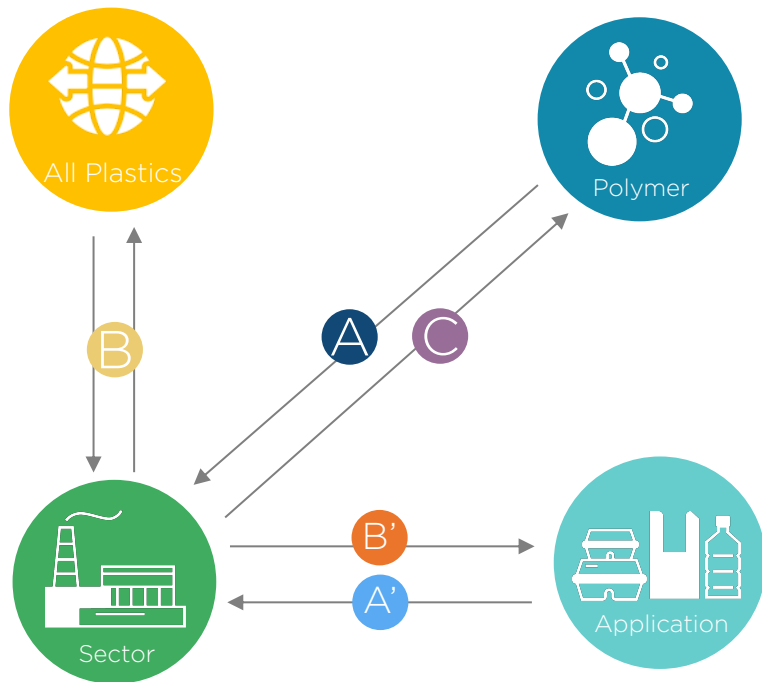
Plastic is known to be used for Packaging, but many other sectors, such as Construction, Automotive, Textile, and Electronics, have plastic embedded in their products. An analysis of plastic flows by Sector allows the user to have a complete view of the plastic used in the market.



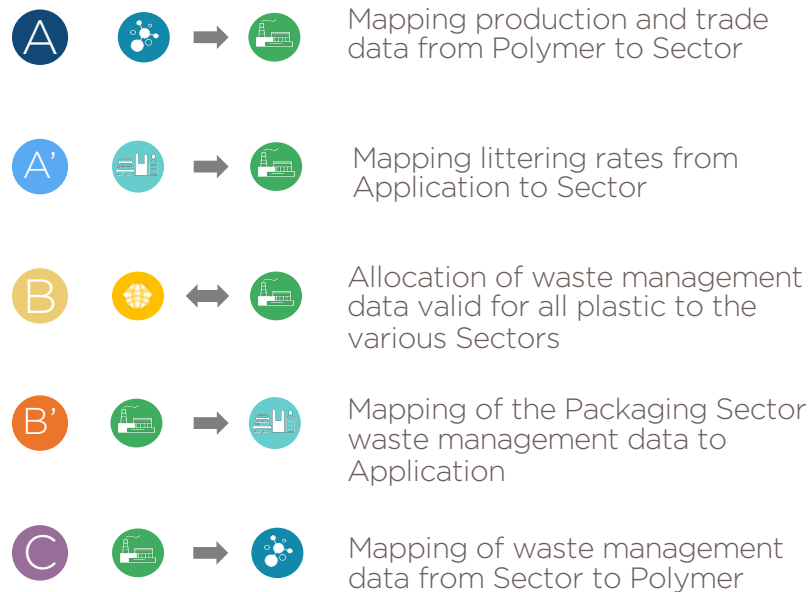
In the application / product focus, one can select specific single-use applications of interest and perform a material flow analysis in order to clearly identify the main contributors to plastic pollution within the list of assessed applications. This space does not necessarily provide the full spectrum of products made of plastic in the country and requires careful interpretation based on the share of total plastic waste covered by the set of applications of interest.

Interconnections of the Dimensions - Including Application

4 dimensions

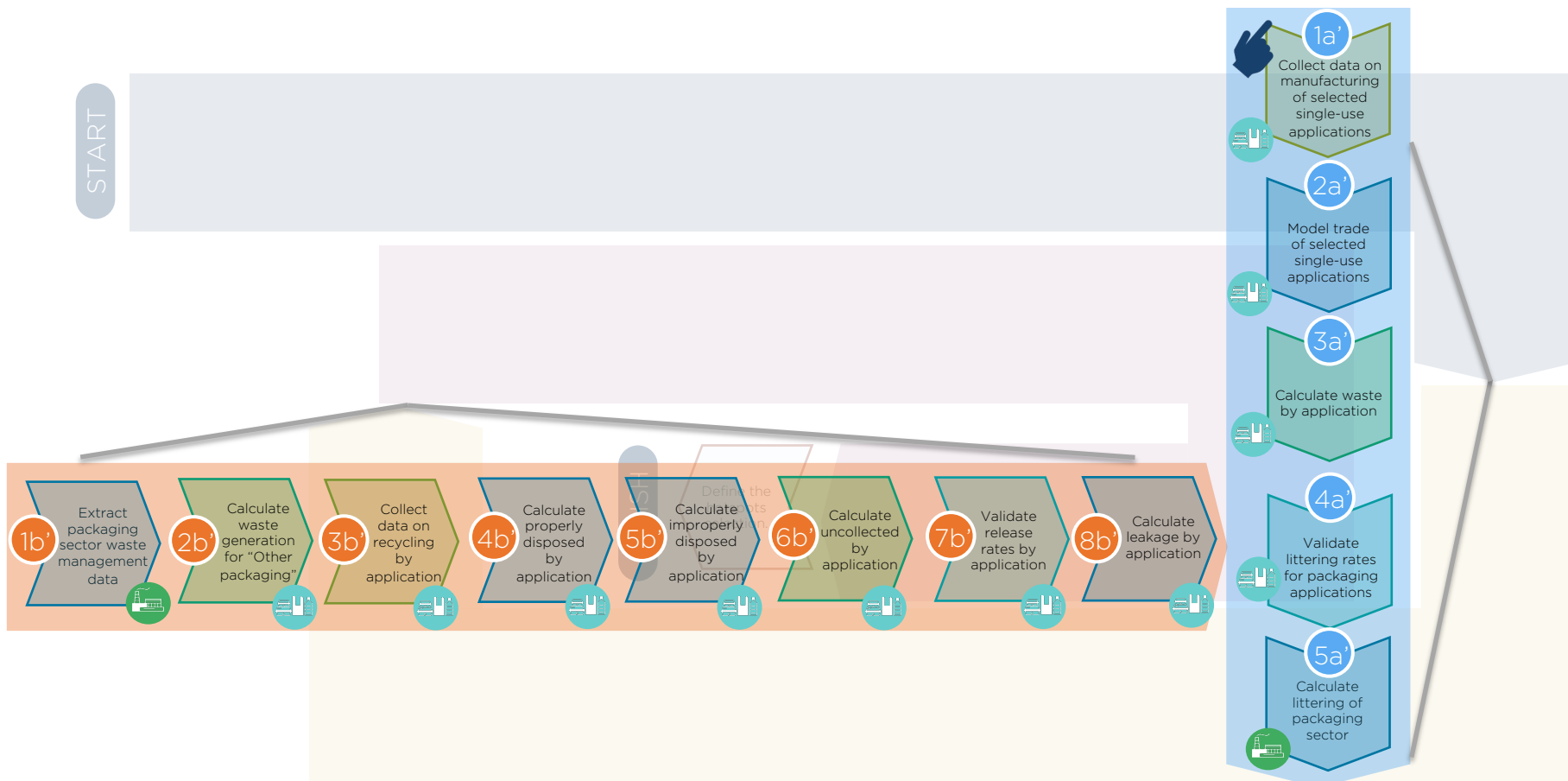


Overarching modelling stages



The National Guidance Tutorial – Including Applications

START



Adding Complexity –Waste Management Hotspots

Using the **module T4** and its tool, one can identify the elements within the waste management and infrastructure chain that have critical influence on plastic leakage.

This is based on the definition if a waste management element is a hotspot or not.

This is both a **quantitative** and **qualitative** decision based on the analysis of the data.



Links to the modules and tools



[Module T4](#)

[Tool T4](#)

Adding Complexity – Geographical Hotspots

By default one can estimate the leakage considering

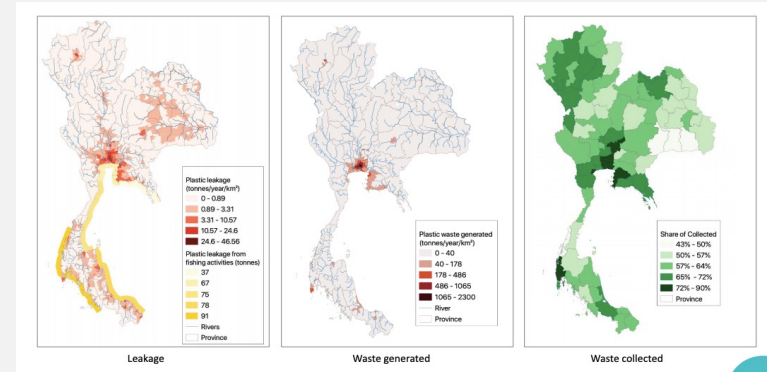
10%
Release
Rate

Applied to the waste mismanaged

This is a fair assumption that will provide the user with an approximate amount of plastic leaked into the environment. This is not an accurate number, as it implies that the release rate does not depend on the geographical area. Users can choose to change this default rate with a closer-to-reality rate if they have a better estimated rate reflecting better their local context.



Otherwise one can do the mapping using GIS resources.



Links to the modules and tools

Video Tutorial, GIS



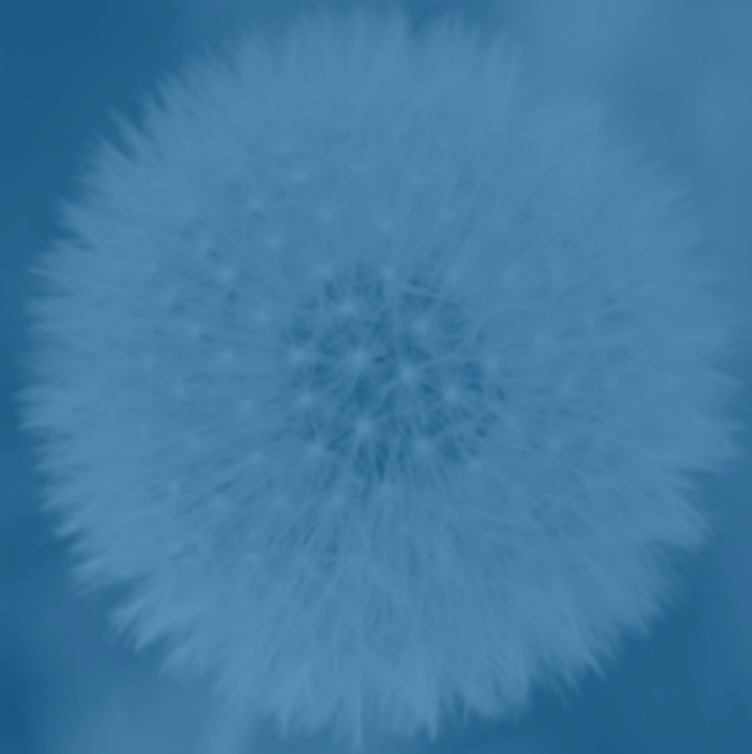
[Module T5](#)

[Tool T5](#)



Click [here](#) to access the video

④ Glossary and Appendix



Glossary

Added stock

Plastic put on the market on a given year that is not becoming waste within the same year. This part of the plastic input is considered as plastic stock for the given year as it will become waste in another year (e.g. plastic used in construction or automotive). Similarly, though, there will be plastic that was put on the market in previous year and that will become waste in the chosen year. The difference between these two quantities is the added stock.

Collection rate

Ratio between the plastic waste collected and generated. Waste Collected includes: Waste export, Recycling, Properly disposed and Improperly disposed.

Domestic waste

Waste generated within the country.

Export

Export of any plastic by the country, in any form, be it primary polymer, plastic product, or plastic embedded in a product (plastic share in cars or phones). It does not include export of plastic waste.

Formal sector

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

Import

Import of any plastic in the country, in any form, be it primary polymer, plastic product, or plastic embedded in a product (plastic share in cars or phones). It does not include import of plastic waste.

Improperly disposed

Waste fraction that is disposed in a waste management system where leakage is expected to occur, such as a dumpsite or an unsanitary landfill. A dumpsite is a particular area where large quantities of waste are deliberately disposed in an uncontrolled manner and can be the result of both the formal and informal sectors. A landfill is considered as unsanitary when waste management quality standards are not met, thus entailing a potential for leakage.

Informal sector

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.

Mass balance

Mass balancing is a mathematical process aiming at equalising inputs and outputs of a given material flow across a system boundary. In our case, inputs consist of domestic production and imports while outputs consists of exports, waste generation and increase of stock. A mass balance allows to check data consistency and helps reconcile different datasets when needed.

Mismanaged waste

It is defined as the sum of uncollected and improperly disposed waste. It is plastic that is prone to be released to the environment. The mismanaged waste index is the ratio of the mismanaged waste and the total waste. It is abbreviated as MWI and its value given in percentage.

Mismanaged Waste Index (MWI)

It is defined as the sum of uncollected and improperly managed waste, divided by the waste generated.

Leakage

It is defined as the plastic released to the to rivers and oceans. The leakage rate is ratio between leakage and total waste generated, and its value is given in percentage.

Littering

Incorrect disposal of small, one-off items, such as: throwing a cigarette, dropping a crisp packet, or a drink cup. Most of the time these items end-up on the road or on side-ways. They may or may not be collected by municipal street cleaning.

Production

Polymer production either from primary virgin source or secondary source (recycled plastic from previous year). It does not include the manufacturing of final products in the country, as this would lead to double counting.

Properly disposed

Waste fraction that is disposed in a waste management system where no leakage is expected to occur, such as an incineration facility or a sanitary landfill. We define a sanitary landfill as a particular area where large quantities of waste are deliberately disposed in a controlled manner (e.g. waste being covered on a daily basis, as well as the bottom of the landfill designed in a way to prevent waste from leaching out).

Recycling

Domestic recycling of waste generated in the country. It does not include recycling of imported waste nor waste collected for recycling in the country that is exported abroad.

Release rate

It is defined as the ratio between leakage and total mismanaged waste, and its value is given in percentage.

Uncollected

Waste fraction that is not collected, either by the formal or the informal sector.

Waste export

Plastic waste collected in the country and exported abroad. It does not include the re-export of imported waste.

Waste generated

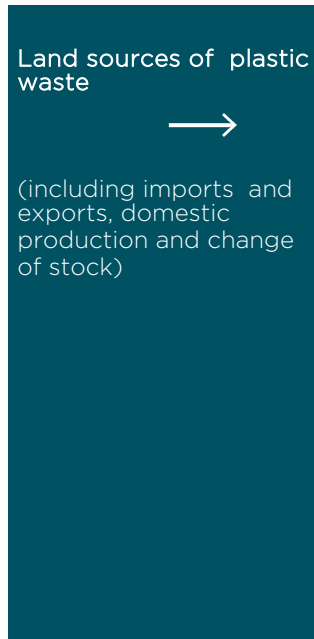
Country domestic plastic waste generation computed as: Production + Import – Export – Added stock.

Waste import

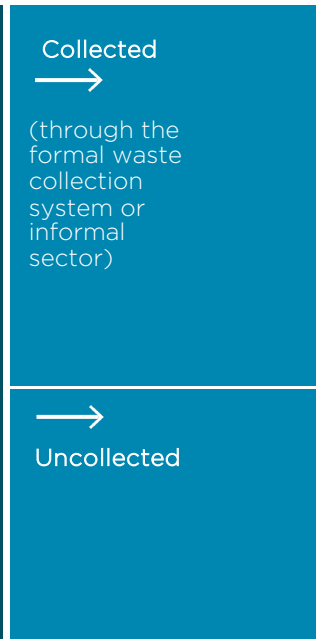
Import of plastic waste from other countries.

Waste flow

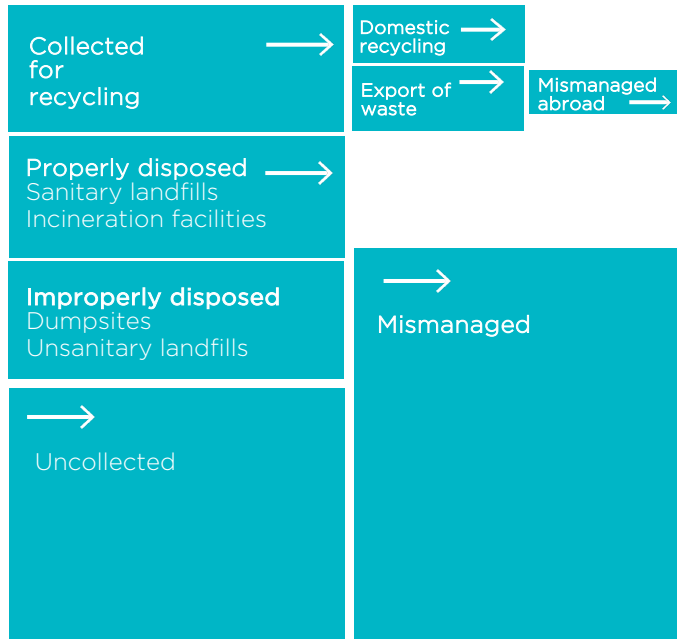
1. Mass of macroplastic waste



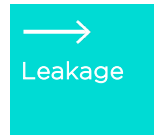
2. Collection



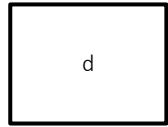
3. Waste management



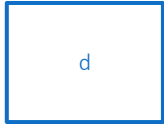
4. Leakage to waterways and ocean



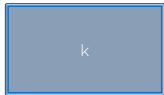
Legend for the schemes



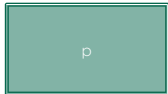
Input / Collected data
Data known at the
present stage



Calculated intermediary data



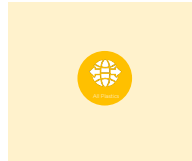
Key
Linear map (in mathematical
terms)



Parameter
Element-wise multiplication



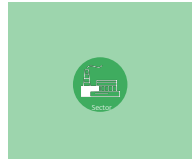
Final output



« All plastic » dimension



« Polymer » dimension



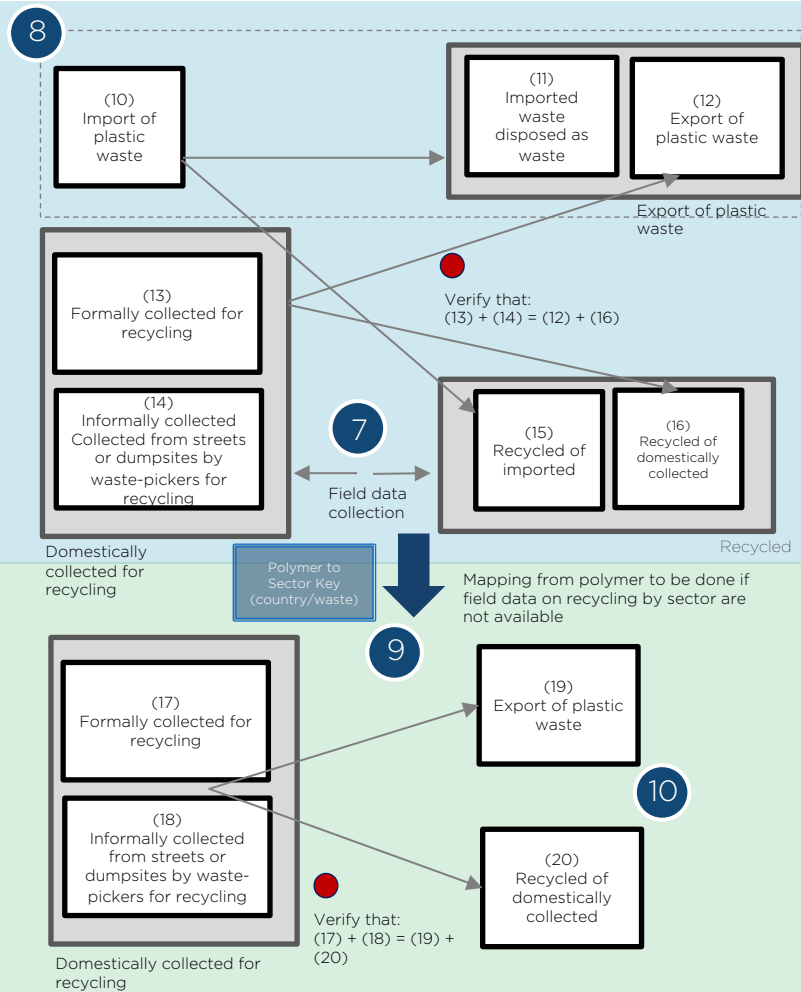
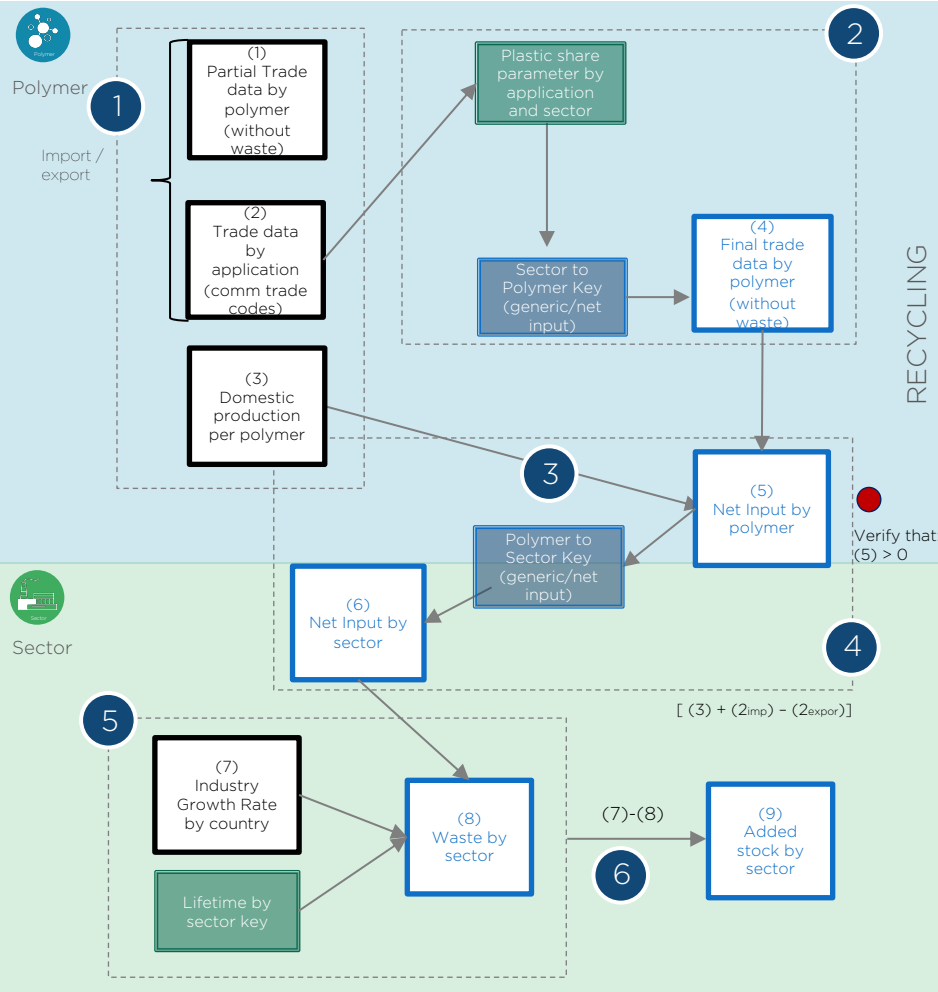
« Sector » dimension



Model check
(mass balance)

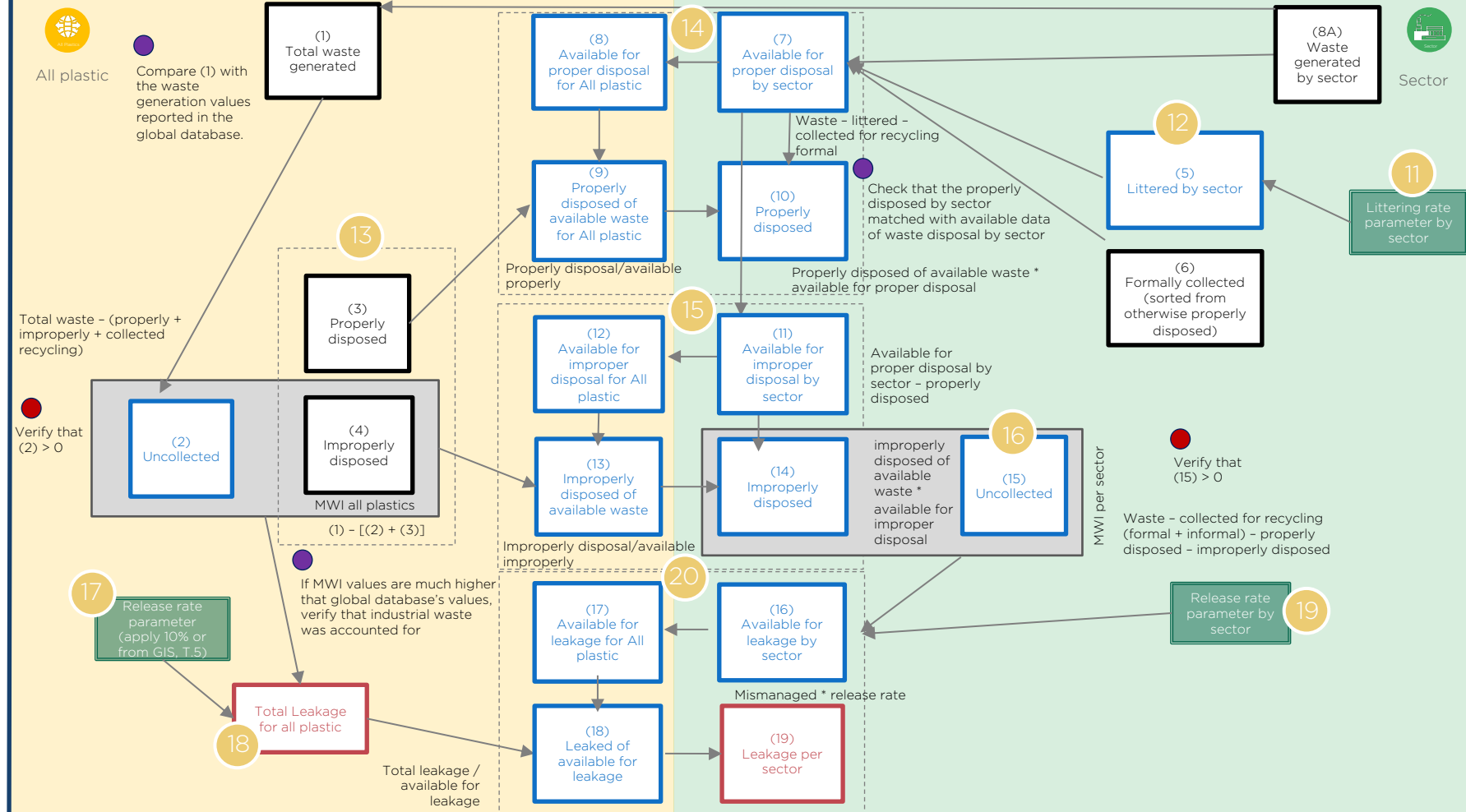


Data check



B

WASTE INPUTS





Sector



Polymer

