NATIONAL GUIDANCE FOR PLASTIC POLLUTION HOTSPOTTING AND SHAPING ACTION

FINAL REPORT FOR MOZAMBIQUE

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A number of organizations participated in the in-country workshop, or contributed data and information to the national hotspotting assessment process, including : **MIMAIP/IIP**, **MIMAIP/DIPOL**, **MTA/DINAB**, **MTA/REV**, **MIC/INNOQ**, **Municipality of Maputo**, **INAMAR**, **Banco Mundial**, **3R**, **AMOR**, **Topack**, **Eduardo Mondlane University**, **WWF Mozambique**, **Repensar**, **FSG**, **KULIMA**.

SUMMARY AT A GLANCE

Global view on plastic in Mozambique

99% Mismanaged rate

32% Collection rate

1% Collection for recycling

1% Domestic recycling rate

17 Kt Leakage

0.6 Kg Per capita leakage

Hotspots

Most critical Polymers

- PET
- LDPE
- PP
- Synthetic Rubber
- Polyester
- HDPE
- PS
- PVC
- Other

Number of hotspots per waste management stage

- Waste generation
- Waste segregation
- Waste collection
- Leakage while waiting for collection
- Waste related behaviors
- Waste management infrastructure

7 out of 128 Districts responsible for **50%** of the plastic leakage

Shaping action from the hotspots

10 Actionable Hotspots

9 Priority Interventions

STRUCTURE AND OBJECTIVE OF THIS PRESENTATION

1

INTRODUCTION TO THE GUIDANCE

Provides the objectives of the Guidance, and introduces its associated workflow and main deliverables.

2

PLASTIC POLLUTION HOTSPOTS

Provides a detailed assessment of plastic leakage across five distinct yet complementary hotspots categories and draws clear statements to help shape action.

3

SHAPING ACTION

Provides a preliminary set of possible interventions and instruments in line with the plastic pollution hotspots results.

4

APPENDICES

Provides additional information including results data tables, hotspot score assessments and modelling assumptions.

5

BIBLIOGRAPHY

STRUCTURE AND OBJECTIVE OF THIS PRESENTATION

1
2
3
4
5

PLASTIC POLLUTION HOTSPOTS

2.1 Country Overview

Provides an outlook of the leakage assessment at the country level.

2.2 Detailed Hotspots Results

Provides a visual analysis and key interpretations across five complementary categories in which hotspots are prioritised based on a plastic leakage assessment.

2.3 Actionable Hotspots

Formulates clear statements based on the detailed hotspot analysis to help shape action towards plastic leakage abatement.

A. Polymer Hotspots

B. Application Hotspots

C. Sector Hotspots

D. Regional Hotspots

E. Waste Management Hotspots

STRUCTURE AND OBJECTIVE OF THIS PRESENTATION

1
2
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4
5

SHAPING ACTION

3.1 Interventions

Suggests meaningful actions based on the actionable hotspots drawn from the detailed plastic hotspot analysis.

3.2 Instruments

Provides a list of possible instruments to implement and monitor progress of suggested interventions.

STRUCTURE AND OBJECTIVE OF THIS PRESENTATION

1
2
3
4 **APPENDICES**

4.1 Data repository

Provides data tables with the detailed figures behind the graphs.

4.2 Data quality assessment

Provides an in-depth analysis of the quality scores behind the graphs.

5 **BIBLIOGRAPHY**

ICONS AND COLOUR CODE TO GUIDE THE READER

Reference to the methodology (module/tool)

Learnings, that complement the key take aways with more details, of information that is not necessarily visible on the graph

Reference to the appendices

Limitations of the study, can be inaccurate data or gap in the modelling

Key take away as the main conclusion of a graph or result in a writen format

Things we foresee to unlock the limitations. They can serve as guidance for future studies

Methodology and appendices

Sections slides

Results and interpretations

KEY DEFINITIONS

Hotspots: They refer to the most relevant plastic polymers, applications, industrial sectors, regions or waste management stages causing the leakage of plastics into the environment (including land, air, water and marine environment), as well as associated impacts, through the life cycle of plastic products.

Interventions: They are tangible actions that can be taken to mitigate hotspots and are to be prioritised and designed to address the most influential hotspots in the plastic value chain.

Instruments: They are the ways an intervention may be practically implemented through specific regulatory, financial or informative measures, in light of context factors such as country dynamics and existing measures. As an illustrative example, a country may identify "mismanaged polyethylene bottles" as one of its hotspots. A relevant intervention may be an increase in bottle collection rate. A relevant instrument may be to instate a bottle return deposit scheme.

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). Landfilling is mainly the result of a formal collection sector.

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.

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 side-ways. They may or may not be collected by municipal street cleaning.

Uncollected: Waste fraction (including littering) that is not collected by the formal sector.

Mismanaged waste: It is defined as the sum of uncollected and improperly disposed waste. 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.

Leakage: Plastic that is released to the environment, specifically to rivers and oceans. The leakage rate is ratio between leakage and total waste generated, and its value is given in percentage.

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

Macro-plastic: Large plastic waste readily visible and with dimensions larger than 5 mm, typically plastic packaging, plastic infrastructure or fishing nets.

Micro-plastic: Small plastic particulates below 5 mm in size and above 1 mm. Two types of micro-plastics are contaminating the world's oceans: primary and secondary micro-plastics. In this study, we focus on primary micro-plastics which are are plastics directly released into the environment in the form of small particulates.

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.

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

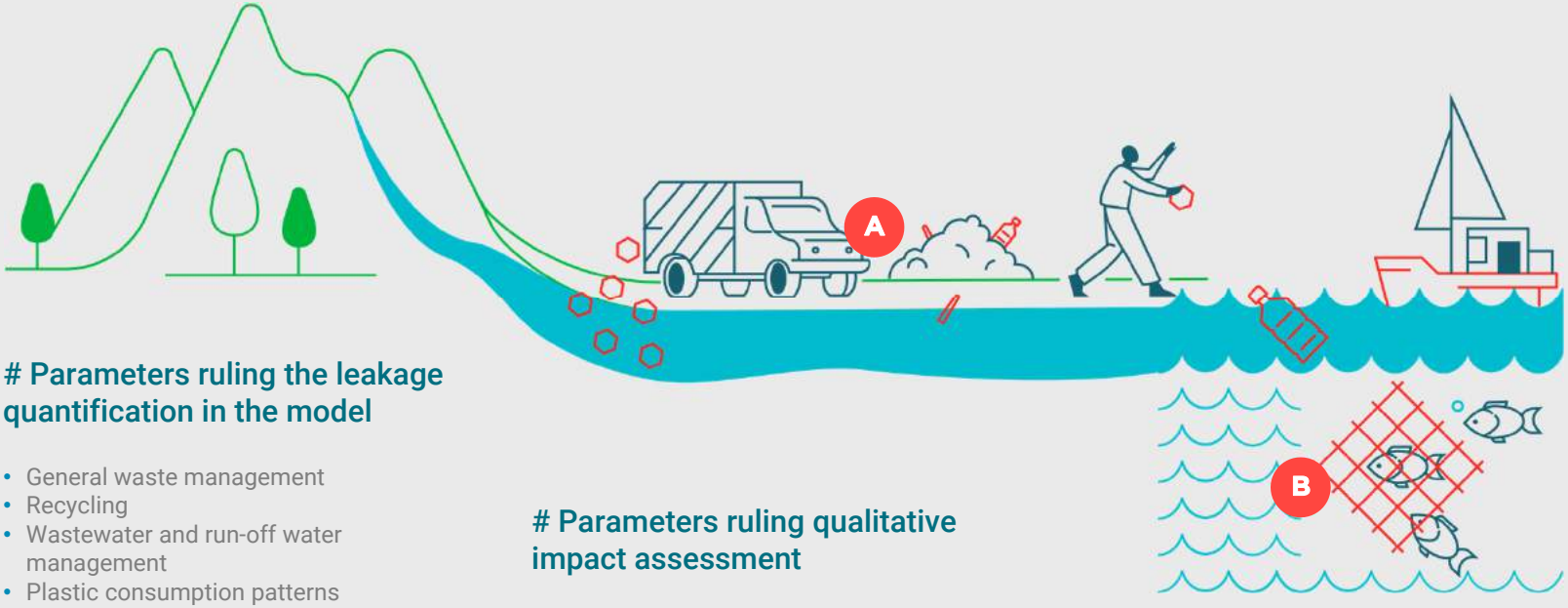
Informal sector: Individuals or a group of individuals who are involved in waste management activities, but are not formally registered or formally responsible for providing waste management services. Newly established formalized organizations of such individuals; for example, cooperatives, social enterprises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

For additional definitions, please refer to the publication: United Nations Environment Programme (2020). National guidance for plastic pollution hotspotting and shaping action - Introduction report. Boucher J., M. Zgola, et al. United Nations Environment Programme. Nairobi, Kenya. Definitions of formal and informal sector are taken from: United Nations Framework Convention On Climate Change - Clean Development Mechanism (UNFCCC-CDM) , 2010, AMS-III.AJ. EB70, Annex 28 - Small-scale Methodology: Recovery and Recycling of Materials from Solid Wastes.

WHAT WE MEAN BY PLASTIC LEAKAGE / IMPACTS

A By plastic leakage we refer to a quantity of plastic entering rivers and the oceans

B By plastic impact we refer to a potential effect the leaked plastic may have on ecosystems and/or human health



Parameters ruling the leakage quantification in the model

- General waste management
- Recycling
- Wastewater and run-off water management
- Plastic consumption patterns
- Population density
- Value of the polymer
- Size of application
- Type of use
- Distance to shore and rivers
- Hydrological patterns

Parameters ruling qualitative impact assessment

- Beach clean-up data
- Size and shape of applications
- Presence of toxic substances in polymers or additives

Leaked plastic stems from uncollected and improperly disposed waste.

Note that the rest of the uncollected and improperly disposed plastic may be leaking into other environmental compartments such as "soil", "air" or "other terrestrial compartment" as defined in the Plastic Leak Project (PLP) guidance.

This information is not required to shape action but could be calculated using the PLP guidance.

LINK to the PLP guidance

LEAKAGE PATHWAY AT A GLANCE

KEY ABBREVIATIONS AND UNITS

Polymer abbreviations

NAME	ABBREVIATION	TYPICAL PRODUCTS
Polyethylene Terephthalate	PET*	bottles, food wrappings
Polypropylene	PP	hot food containers, sanitary pad liners
Low-density Polyethylene	LDPE	bags, container lids
High-density Polyethylene	HDPE	milk containers, shampoo bottles
Polystyrene	PS	food containers, disposable cups,
Polyvinyl Chloride	PVC	construction pipes, toys, detergent bottles

*In this study, PET resins are distinguished from Polyester which includes polyester fibres, polyester films and polyester engineered resins.

Key units

NAME	SYMBOL
Kilogram	kg
Tonne	t
Kilo tonne (or thousand tonne)	kt
Mega tonne (or million tonne)	Mt
Kilometer	km
Square kilometer	km^2

Calculation variables

NAME	ABBREVIATION
Mismanaged waste index	MWI
Leakage rate	LR
Release rate	RR

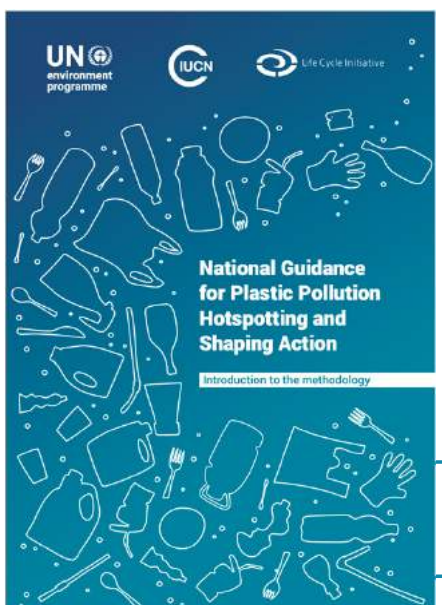
1 INTRODUCTION TO THE GUIDANCE

National guidance for plastic pollution hotspotting and shaping action

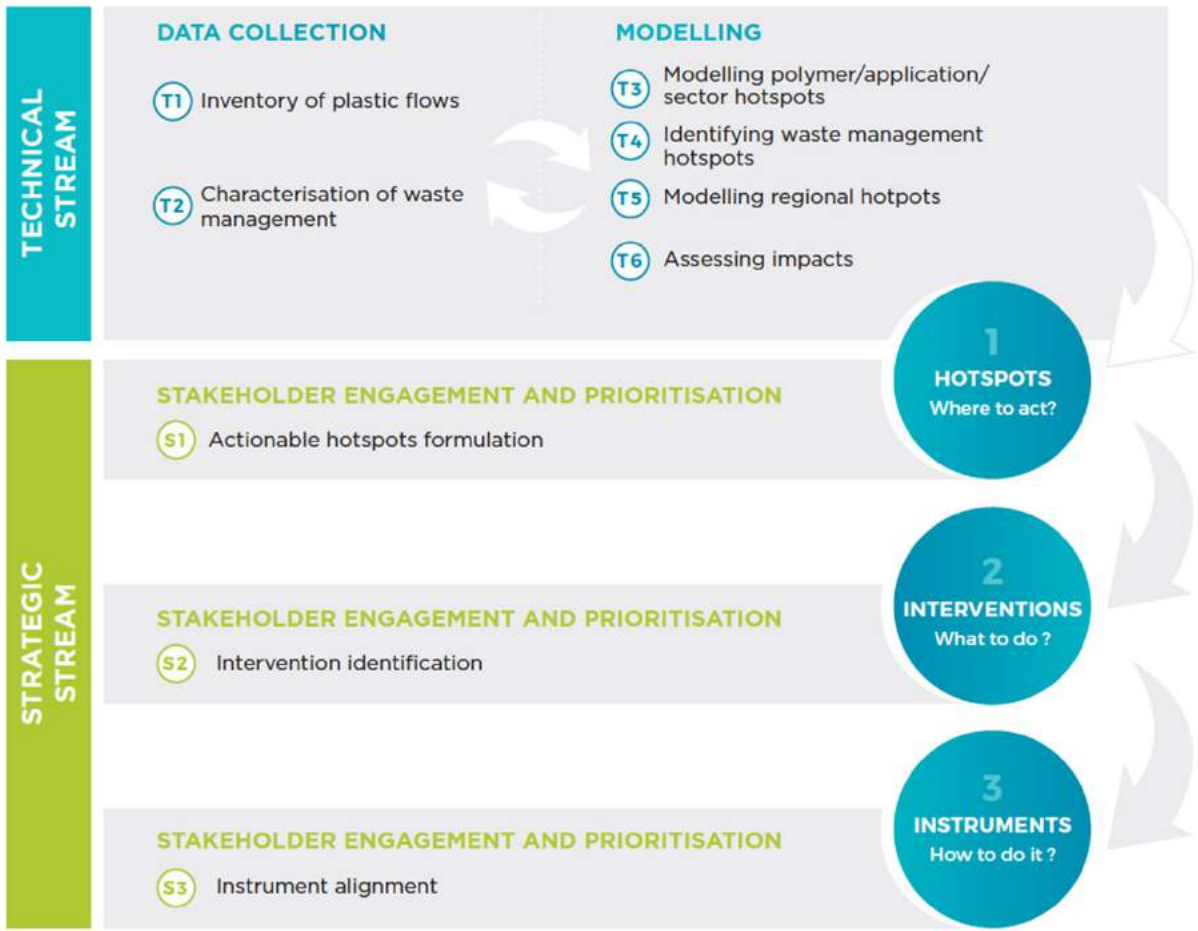
SCHEMATIC OF THE GUIDANCE

The guidance allows users to:

1. Generate country-specific plastic waste management datasets
2. Identify plastic leakage and pollution hotspots
3. Prioritise actions



LINK to the guidance



RELATIONSHIP BETWEEN HOTSPOTS, INTERVENTIONS AND INSTRUMENTS

The guidance is built upon the backbone of three questions: where to act? (Hotspots), what to do? (Interventions) and how to do it? (Instruments)

1 A component of the system that directly or indirectly contributes to the magnitude of plastic leakage and/or its impacts. It can be a component of the system, a type of product/polymer or a region within the country.

2 An action that can be taken to mitigate the leakage from a given hotspot or reduce its impacts.

3 A practical way to implement the intervention and enable progress.

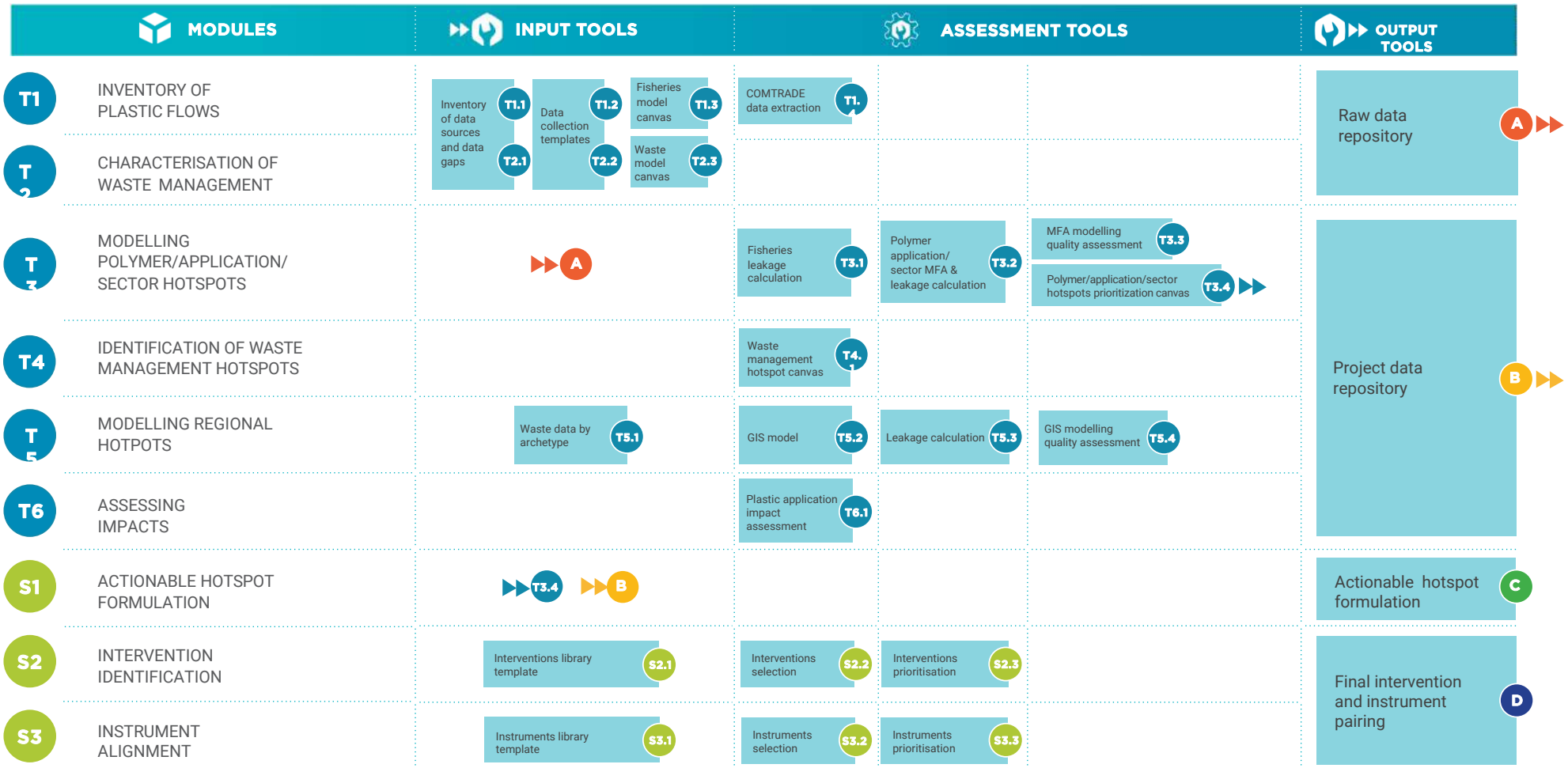
Examples

- Low recycling rate for flexible packaging
- Single-use plastic bags
- Low waste collection rate in rural areas

- Implement better eco-design + chemical recycling
- Reduce plastic bag use in the country
- Increase waste collection

- Develop funding mechanism through EPR scheme
- Ban on plastic bags / introduce re-usable alternative
- Help local waste pickers to create a revenue stream

STRUCTURE OF TOOLS ASSOCIATED WITH EACH MODULE



DISCLAIMER

This report intends to present **only the results of the analysis** and not the detailed modelling process.

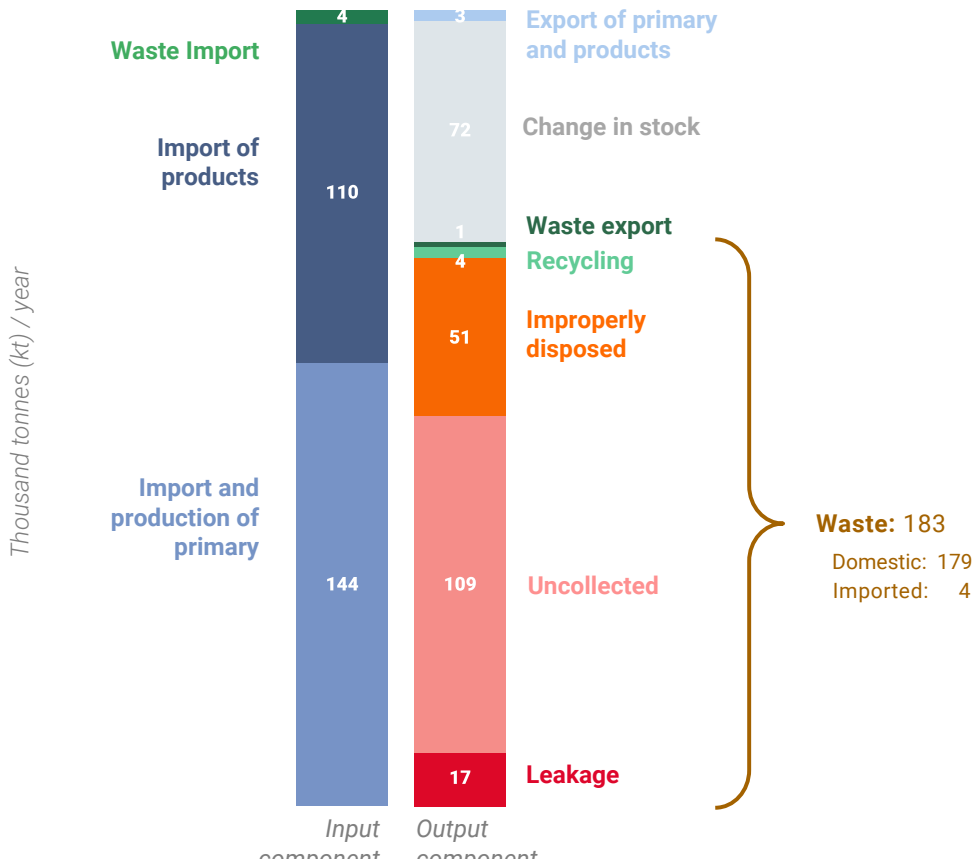
Additional information on the methodology and modelling process can be found directly in the **modules and tools** associated with the guidance and highlighted by this icon.

2 PLASTIC POLLUTION HOTSPOTS

2.1 COUNTRY OVERVIEW

COUNTRY PLASTIC MATERIAL FLOW [2018]

Summary of the results for all plastics in the country



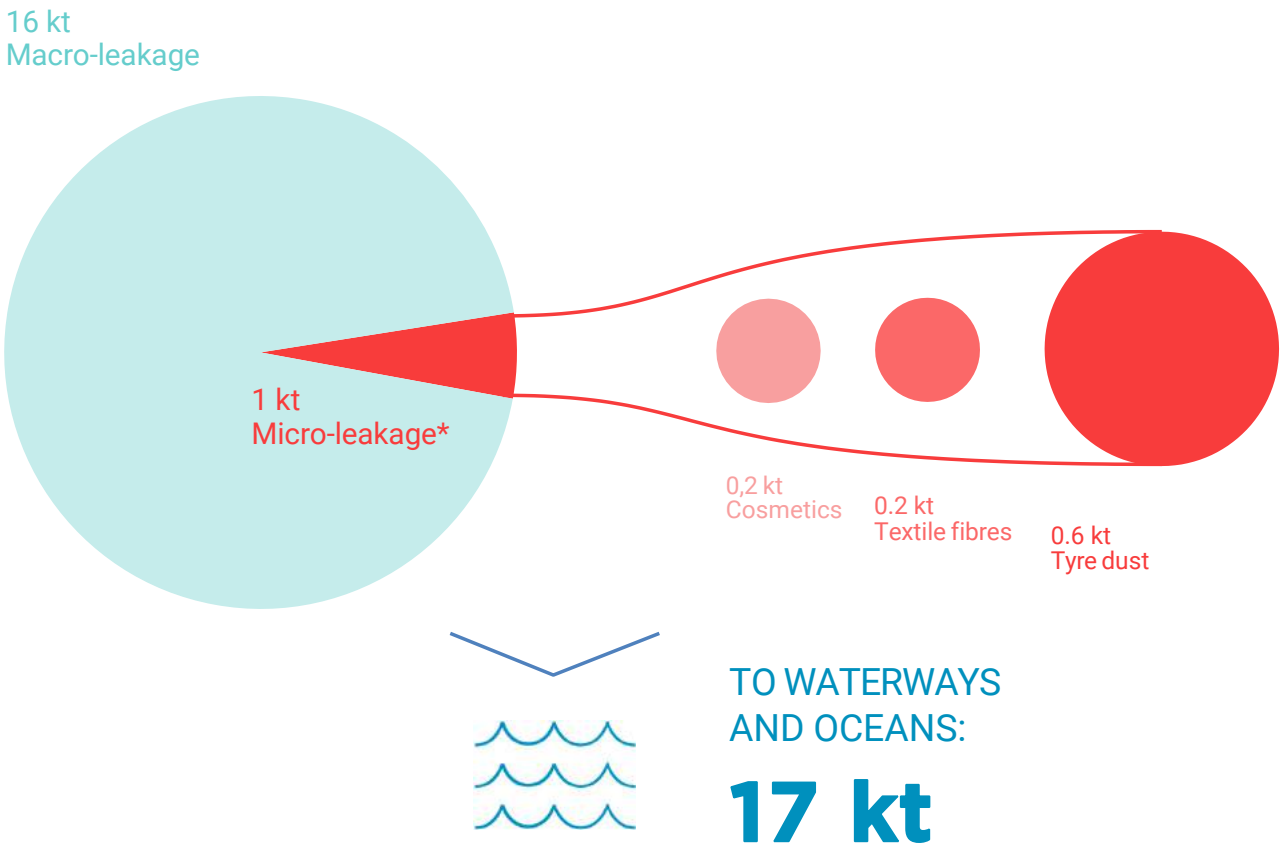
Note: For simplicity, in this figure, we removed a part of the "leakage" from the "improperly disposed" and "uncollected", so that the values displayed for these two metrics correspond to a post-leakage situation.

Key take-aways

- There is no domestic production of plastic in Mozambique, all plastic consumed is imported.
- The average plastic waste generated per capita is **6.1 kg/capita/year**, which is much smaller than the world average plastic waste generation of 29 kg/capita/year*.
- Mozambique has a low collection rate (30%), and all collected plastic waste is improperly disposed either in unsanitary landfills or dumpsites, except for a small amount that is recycled (1% of plastic waste generated).
- In Mozambique, around **17 kt** of plastic waste is leaking into rivers and the ocean. This means that 10% of plastic waste generated is leaking into the marine environment. This is equivalent to an individual leakage of **0.6 kg/capita/year**.

* Average plastic waste generation per capita values are derived from the What a Waste 2.0 database (*Kaza et al., 2018*)

MACRO-LEAKAGE VS MICRO-LEAKAGE



Key take-aways

- **Macro-leakage contributes for 95% of the overall country leakage.** This is common for countries where solid waste is significantly mismanaged.

Learnings

While tyre dust due to tyre abrasion from road vehicles is the first cause of primary plastic micro-leakage, micro-leakage of textile fibres from clothes washing and of microbeads from cosmetic products are also close in absolute value. This is due to the absence of wastewater treatment that provides no barrier to the release of primary plastic micro-particles in waterways and oceans. Contrary to other countries, Mozambique does not generate any leakage from primary pellets (due to losses during the production and transport process) since the country does not produce any primary plastic.

* The methodology used to calculate micro-leakage is based on the Plastic Leak Project (2019)

OPEN BURNING: A ROUGH ESTIMATE

178 kt
Total plastic mismanaged

45%
released into the air as noxious chemical substances through open burning

POLLUTION TO THE AIR:
80 kt

Key take-aways

- **Open burning** of mismanaged plastic waste in Mozambique poses significant risks for human health (due to the release of noxious chemical substances such as dioxins and particulate matters) and directly contributes to climate change.

Limitations

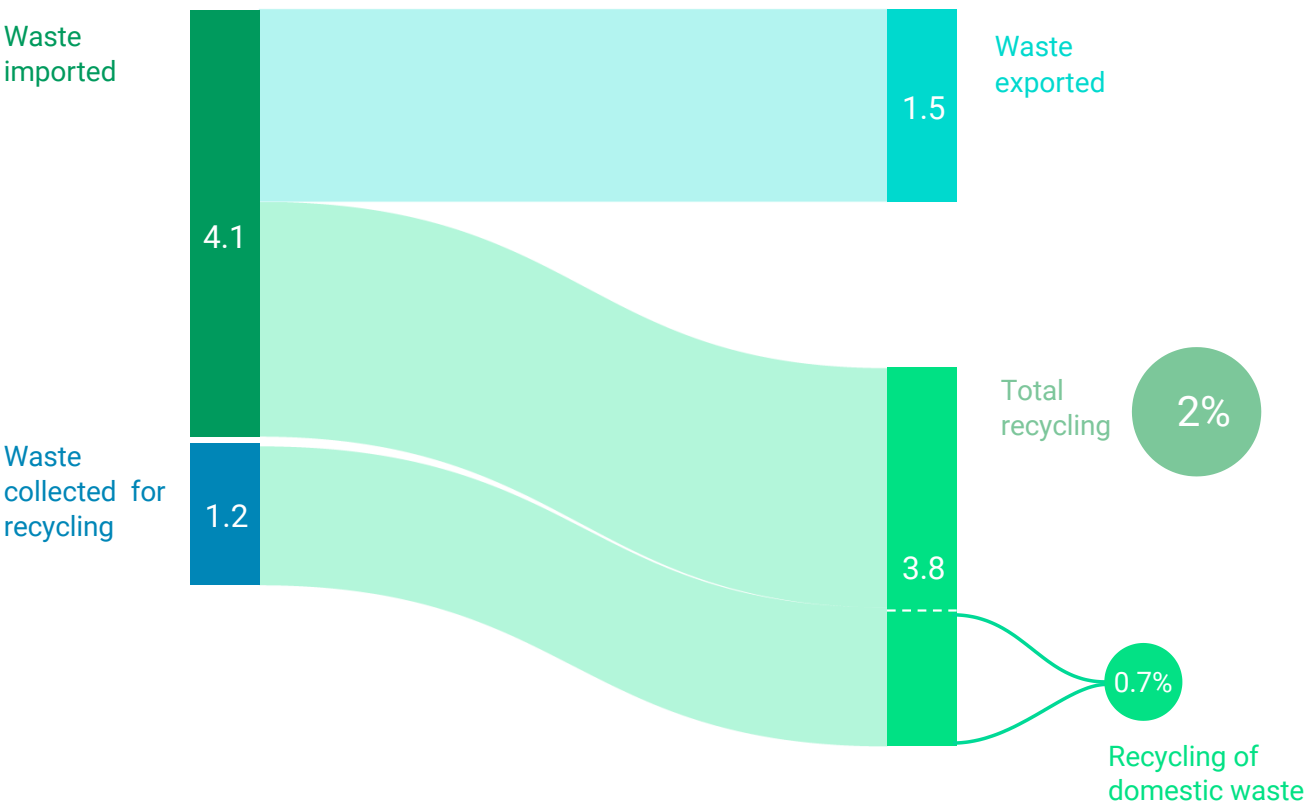
Although we do not have specific data on burning, we suggest a rough estimate of how much plastic could be polluting the air by using the assumptions made in the *Breaking the Plastic Wave* report (*Lau et al., 2020*): 60% of uncollected plastic waste and 13 % of plastic waste at dumpsites are burnt on average worldwide. In the case of Mozambique, it would translate into having 45% of the total plastic mismanaged ending up polluting the air through open burning.

Unlocking limitations

Investigate open burning practices and conduct field studies to estimate the amount of mismanaged plastic waste that is burned.

DOMESTIC RECYCLING AND TRADE OF WASTE

Quantities in thousand tonnes



Key take-aways

- **Less than 1%** of the 179 kt of domestically generated waste are recycled.

Limitations

There is no clear understanding of the fate of the imported plastic waste. The recycling companies that were contacted did not mention import of waste as a source of recyclable material. Here, it is assumed that the plastic waste imported is re-exported (1.5kt according to UN Comtrade) and that the remainder is locally recycled.

Unlocking limitations

Contact customs to know who the imported plastic waste is destined to.

2.2 DETAILED HOTSPOTS RESULTS

5 CATEGORIES OF HOTSPOTS

WHAT

WHAT

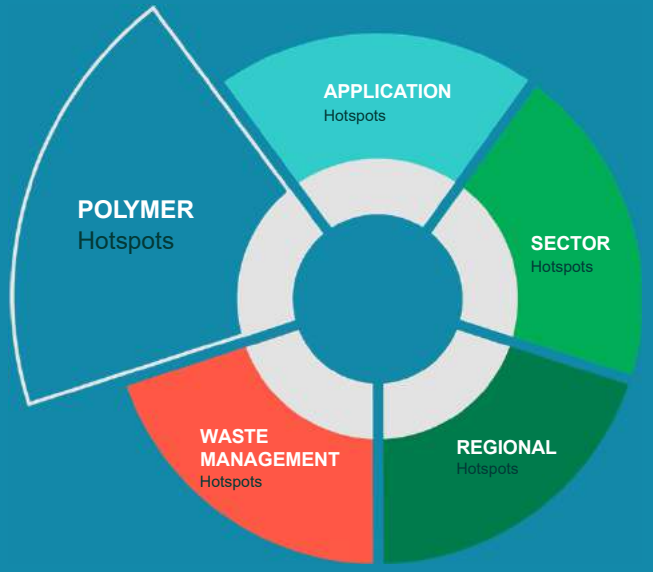
WHERE

WHERE

WHY

ACTIONABLE HOTSPOTS FORMULATION

A POLYMER HOTSPOTS

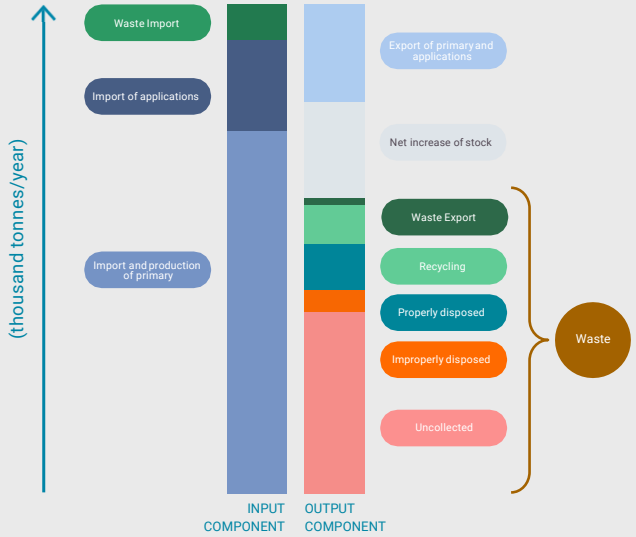


OBJECTIVE AND INSTRUCTIONS

Key question answered:

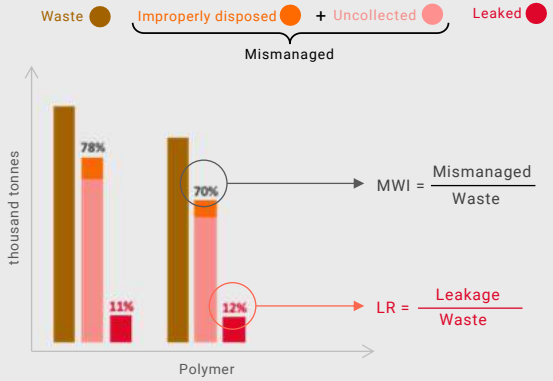
Which polymers are most critical in the country regarding plastic leakage?

What are the bar components of the polymer mass balance graph?

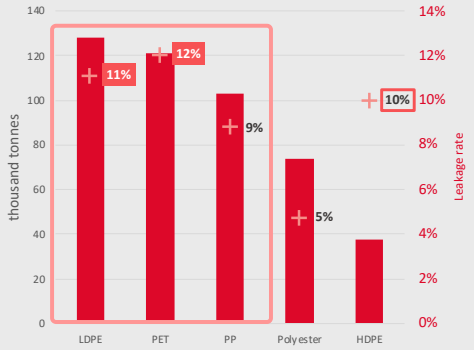


How to read the polymer hotspot graph?

1. Determine leakage from mismanaged waste



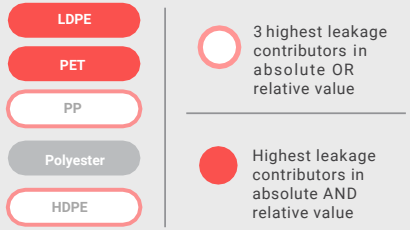
2. Focus on leakage and leakage rate



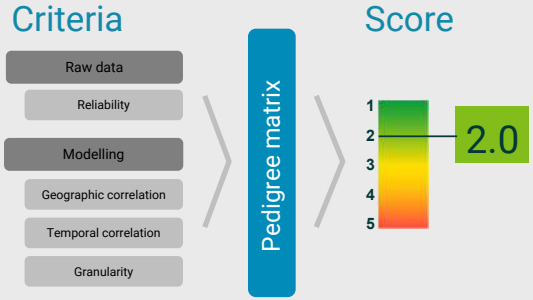
For more details, please read the Methodology

T3

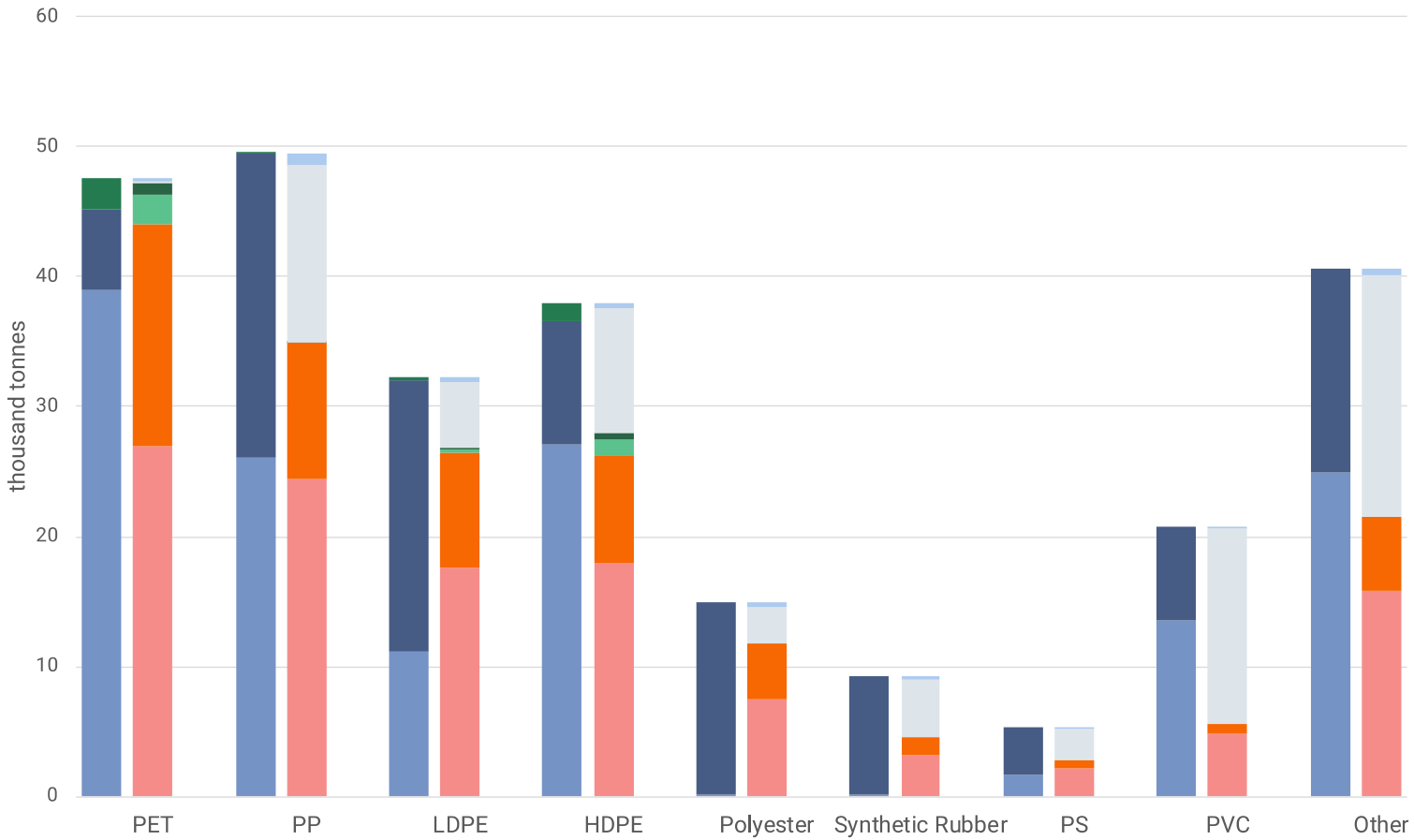
3. Select hotspots based on absolute and relative leakage



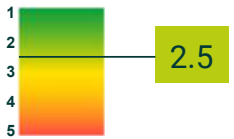
4. Assess the quality score of the results



MASS BALANCE BY POLYMER [2018]



Quality Score



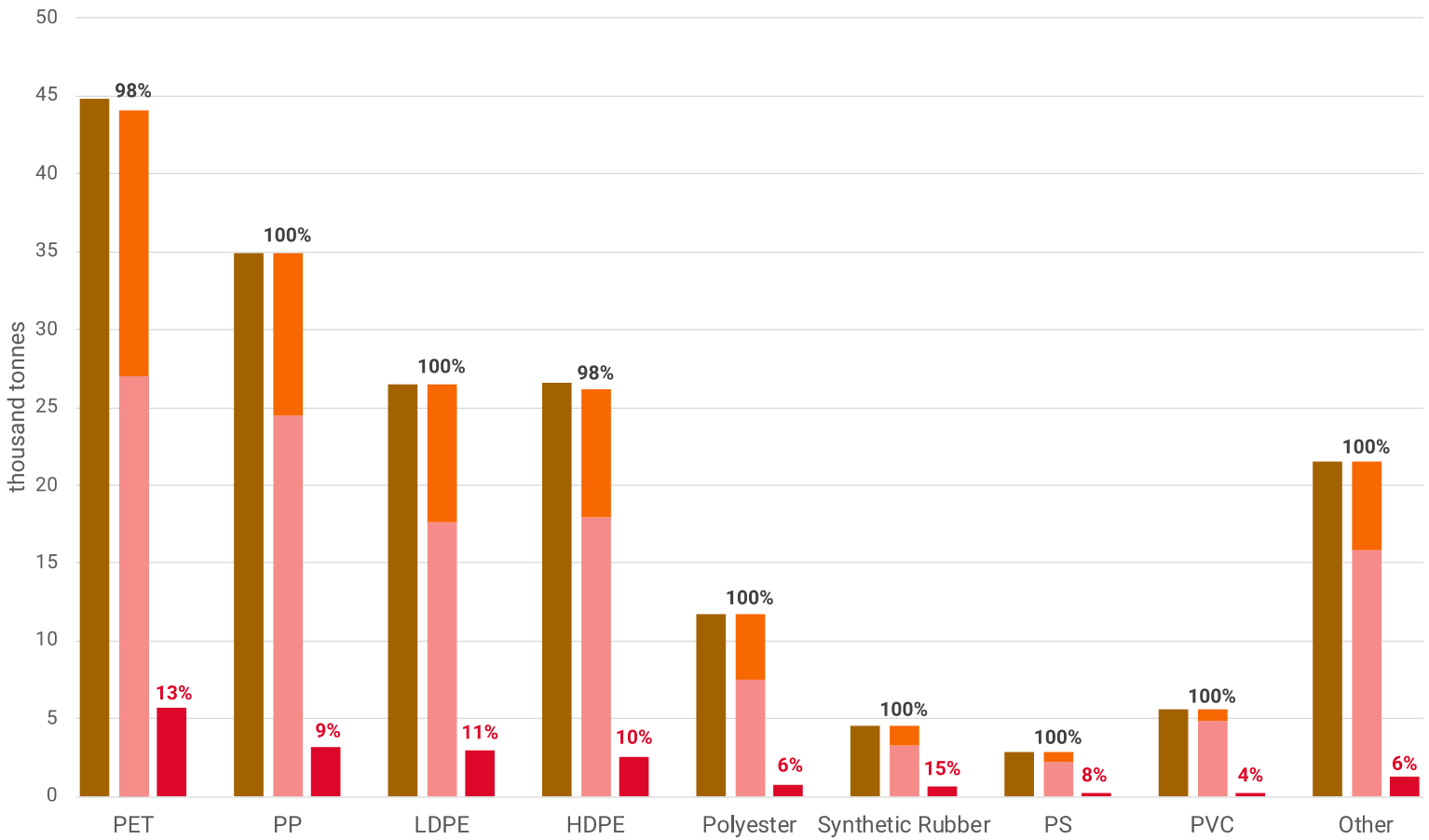
INPUT

- Waste Import
- Import of products
- Import and production of primary

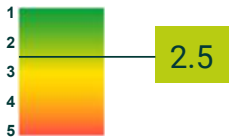
OUTPUT

- Change in stock
- Waste Export
- Export of primary and products
- Recycling
- Properly disposed
- Improperly disposed
- Uncollected

MISMANAGED WASTE AND LEAKAGE BY POLYMER [2018]



Quality Score



Domestic waste

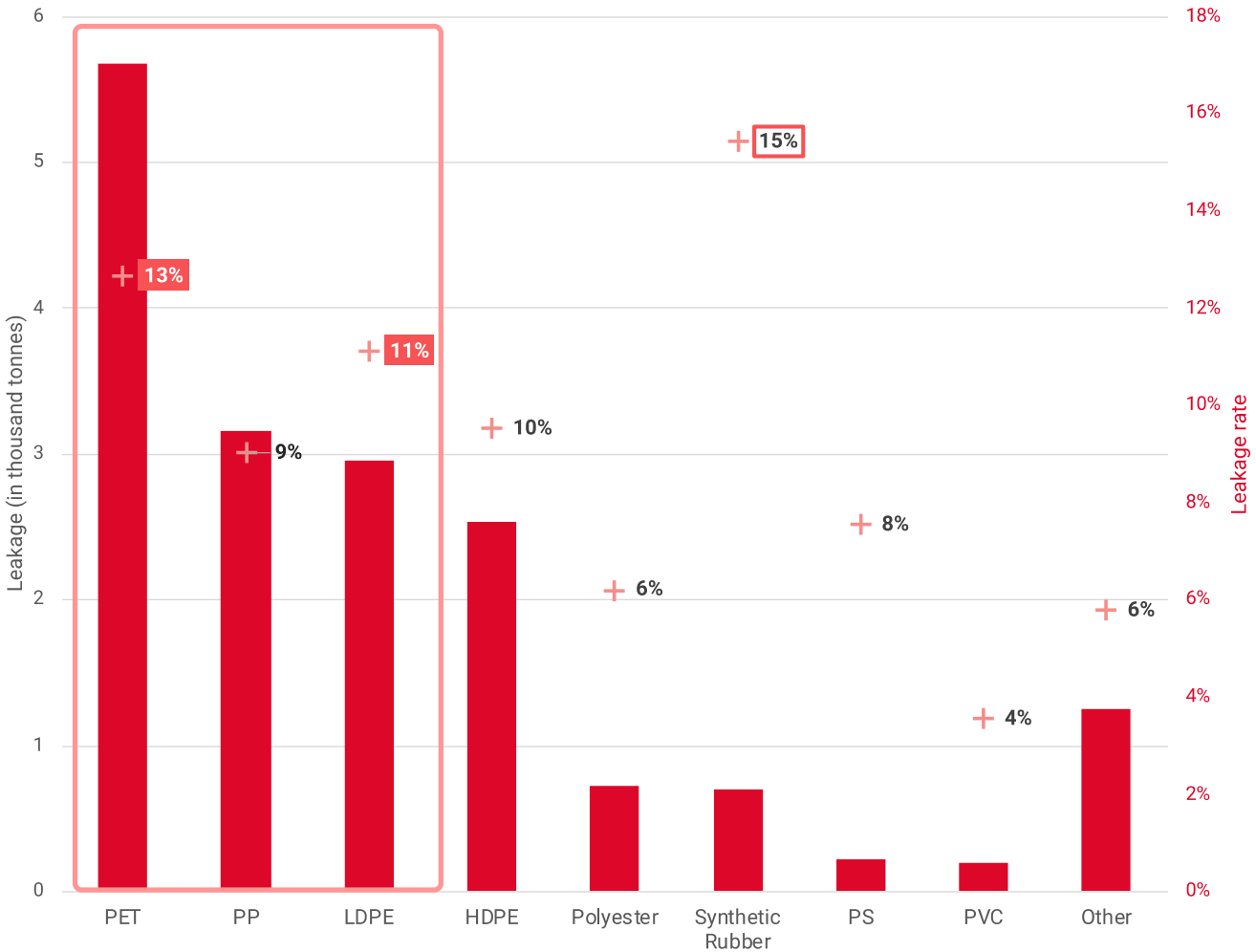
Improperly disposed + Uncollected } Mismanaged

Leaked

X% | Mismanaged Waste Index (MWI)

X% | Leakage Rate (LR)

POLYMER HOTSPOTS [2018]

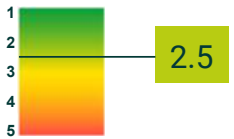


PET
LDPE
PP
Synthetic Rubber
HDPE
PS
Polyester
PVC
Other

3 highest leakage contributors in absolute OR relative value

Highest leakage contributors in absolute AND relative value

Quality Score



Key take-aways:

- **PET** is the top contributor in absolute leakage (5.7 kt), with a leakage rate of 13%.
- **PP** and **LDPE** follow with 3.2 kt and 3.0 kt of leakage respectively. LDPE has a leakage rate of 11%.
- Out of the 0.7 kt of **Synthetic Rubber** leaking into the ocean, 0.6 kt come from tyre abrasion.

POLYMER HOTSPOTS:
INTERPRETATION AND LIMITATIONS

PET

Learnings

PET is a top leaking polymer by absolute leakage. PET is also the polymer with the highest waste generation, and it is mostly used in packaging. Even though it is one of the polymer most likely to be collected for recycling, only 2% of the PET disposed in Mozambique is collected for recycling.

LDPE

Learnings

LDPE ranks third in absolute leakage and has a relative leakage of 11% (meaning that 11% of LDPE waste generated leaks into the oceans). This makes it a priority hotspot to tackle in the country.

PP

Learnings

PP has the second absolute leakage in the country. It is the most consumed polymer in Mozambique, but out of the 48 kt of PP put on the market, a third of it becomes stock, embedded in long-lived products. Out of 35 kt that became waste in 2018, none was recycled. The lack of recycling together with the high mismanagement rate cause PP to be the second most leaked polymer by absolute leakage.

Synthetic Rubber

Learnings

High relative leakage rate of Synthetic Rubber (15% of generated waste) is due to a high micro-leakage from tyre abrasion on the roads, compared to the relatively low waste generation.

POLYMER HOTSPOTS:
INTERPRETATION AND LIMITATIONS

All polymers

Learnings

Because of the absence of sanitary landfills and incineration facilities in Mozamnbique, all plastic waste that is not recycled is mismanaged and is susceptible to leak into waterways. Since less than 1% of generated plastic waste is recycled, the MWI is above 98% for all polymers. As a consequence, there are only two factors that influence whether a polymer is a hotspot or not: the amount of plastic waste generated and its release rate (mostly related to the product size).

Limitations

In Comtrade, plastic trade data reported by Mozambique are much smaller than trade data reported by trading partner countries. In this study, for each commodity code, we decided to choose the highest trade value between the one reported by Mozambique and the one reported by the trading partners.

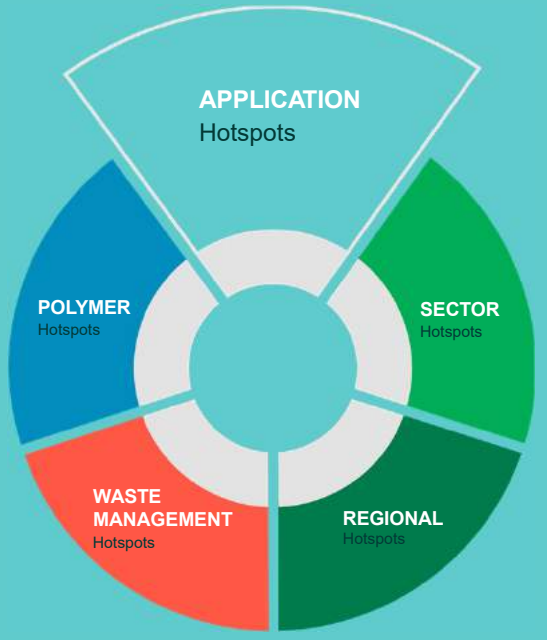
Limitations

- Mozambique imports almost half of the plastic it consumes in the form of final or semi-final products. As the polymer composition is usually unknown for comtrade products, we estimate it by mapping each product to the polymer shares associated with its sector. In Mozambique, this has to be done for 28% of the plastic consumed in the country. For this study, we used data from the European market analysis performed by PlasticsEurope (2018), as no analysis of polymer composition by sector was available for Mozambique.
- Recyling quantities by polymer might not be well captured in our model as we built recycling figures from the ground up using multiple sources. We may have missed some recycling actors especially from the informal sector.

Unlocking limitations

- Perform an analysis of polymer consumption by sector based on the Mozambique market would improve the quality of the analysis.
- Gather additional knowledge on the existing recycling actors and their market.
- Improve reporting of trade quantities at customs in Mozambique.

B APPLICATION HOTSPOTS

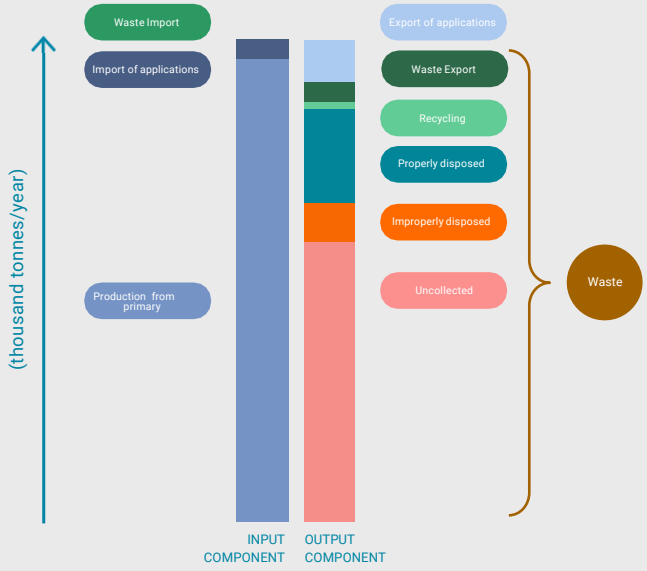


OBJECTIVE AND INSTRUCTIONS

Key question answered:

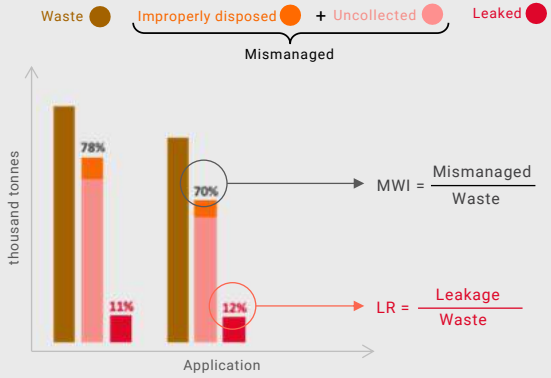
Which applications are most critical in the country regarding plastic leakage?

What are the bar components of the application mass balance graph?

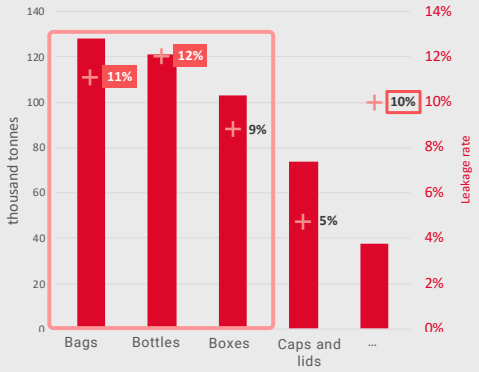


How to read the application hotspot graph?

1. Determine leakage from mismanaged waste



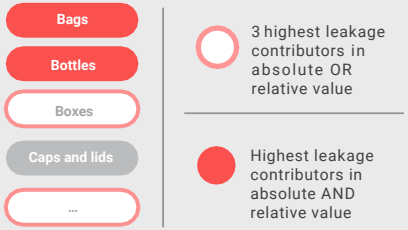
2. Focus on leakage and leakage rate



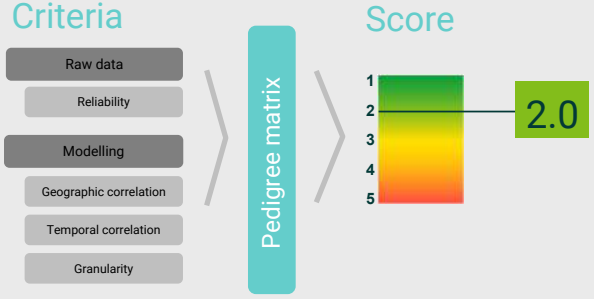
For more details, please read the Methodology

T3

3. Select hotspots based on absolute and relative leakage

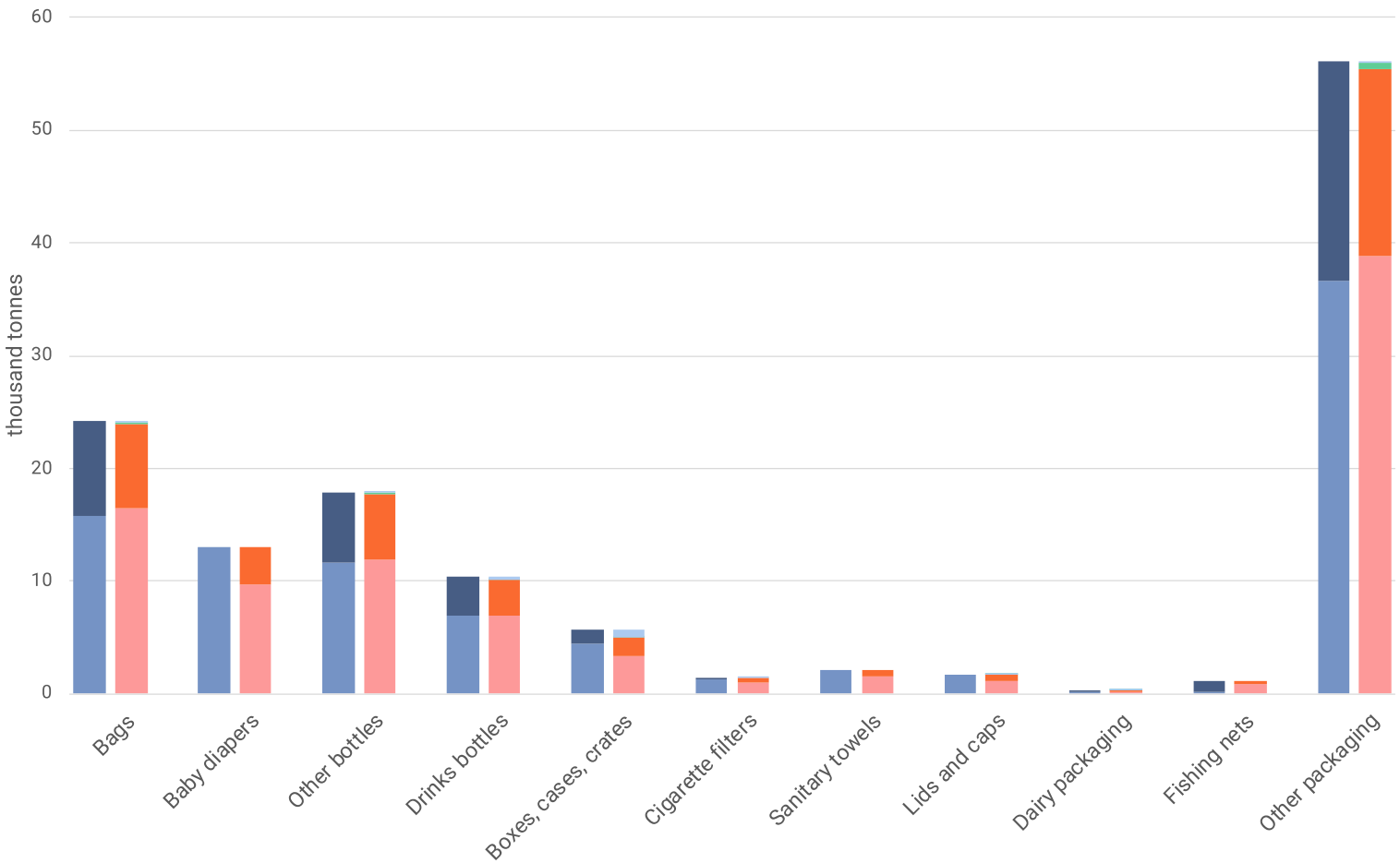


4. Assess the quality score of the results

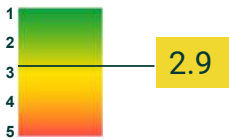


MASS BALANCE BY APPLICATION [2018]

The application analysis covers most of known short-lived products, which corresponds to **74% of total plastic waste** generated in the country in 2018.



Quality Score



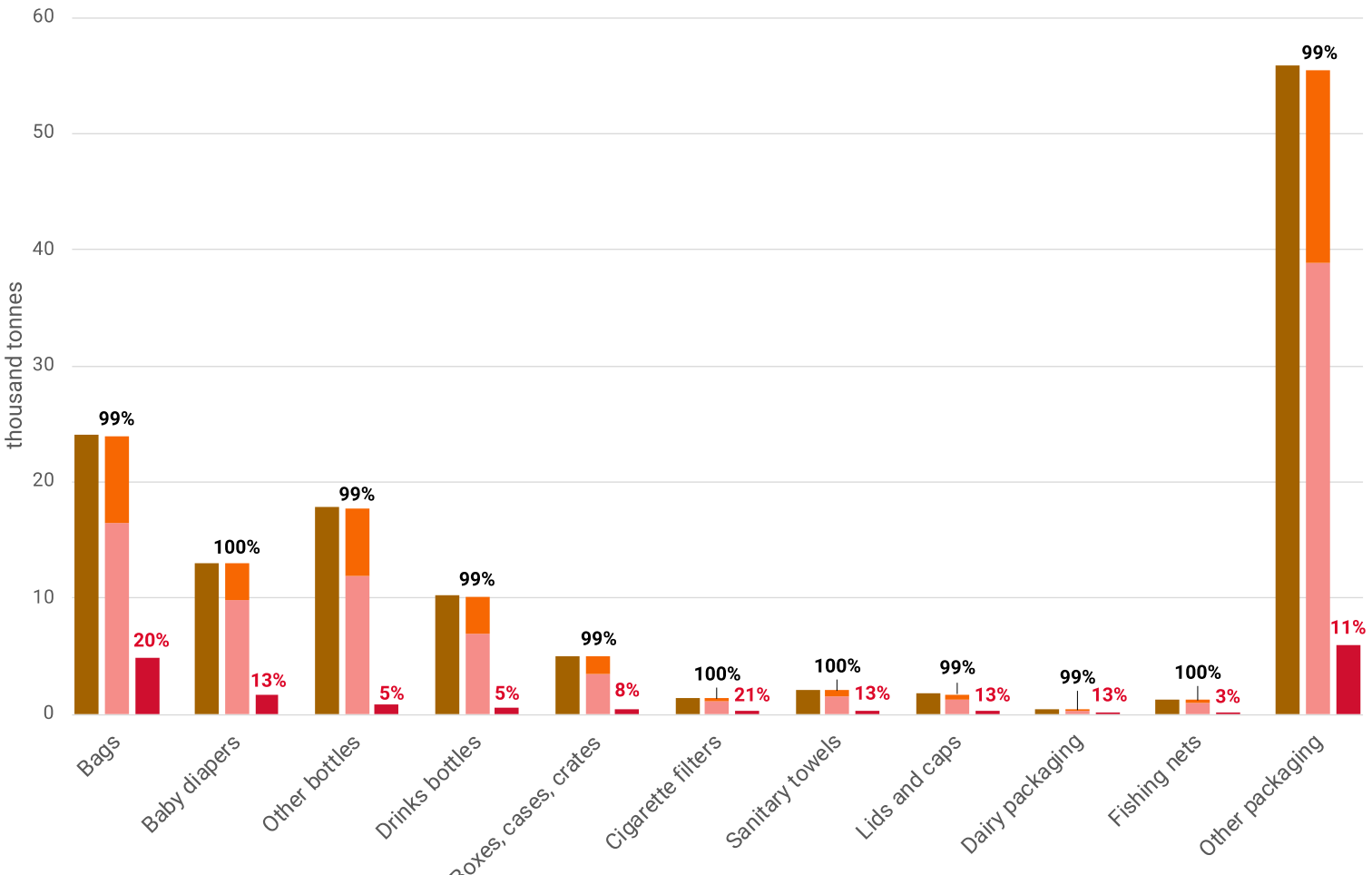
INPUT

- Waste Import
- Import of products
- Import and production of primary

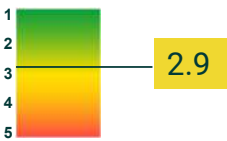
OUTPUT

- Waste Export
- Export of primary and products
- Recycling
- Properly disposed
- Improperly disposed
- Uncollected

MISMANAGED WASTE AND LEAKAGE BY APPLICATION [2018]



Quality Score



Domestic waste

Improperly disposed

+

Uncollected

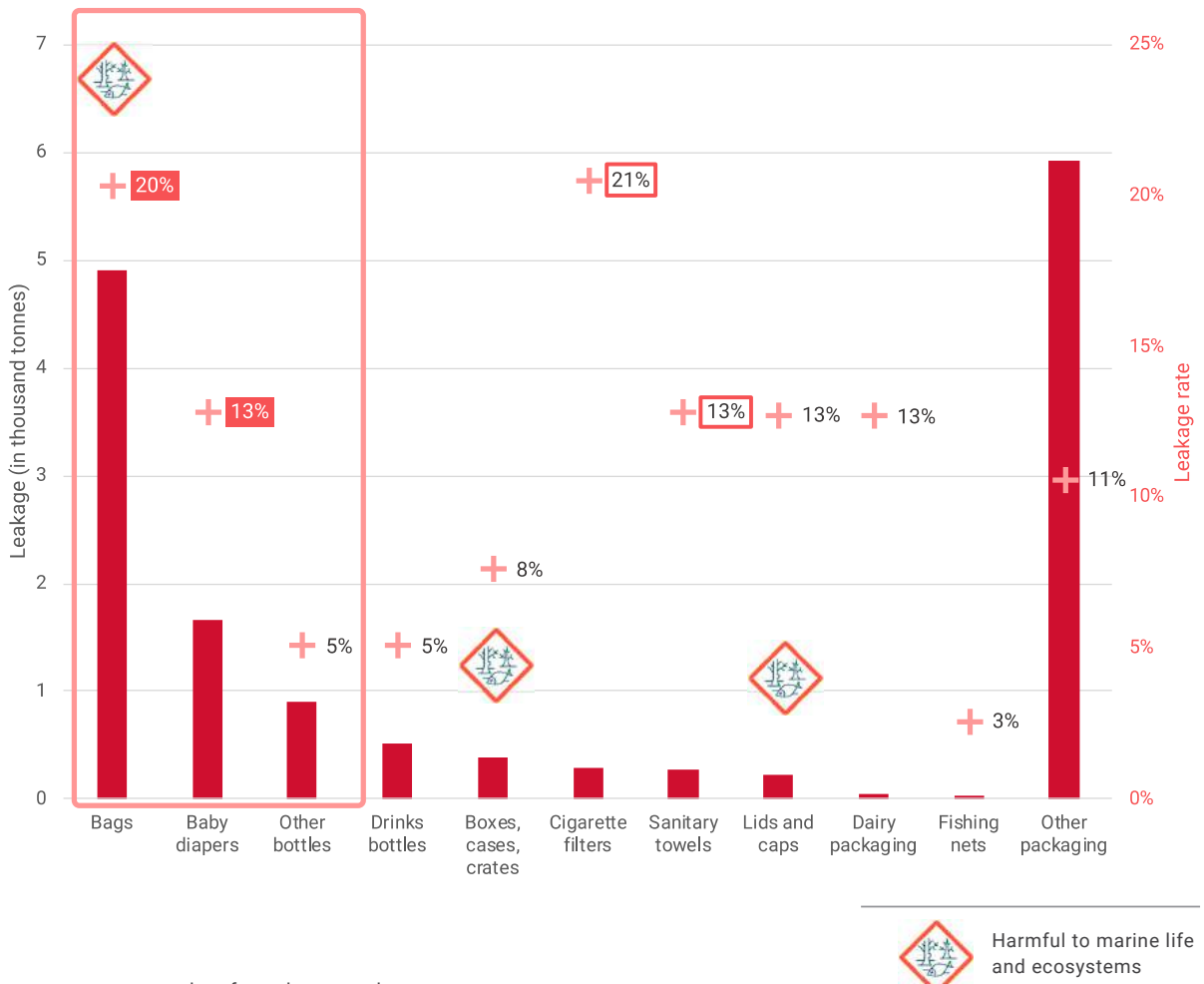
Mismanaged

Leaked

X% | Mismanaged Waste Index (MWI)

X% | Leakage Rate (LR)

APPLICATION HOTSPOTS [2018]

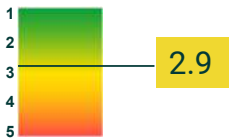


Bags
Baby diapers
Cigarette filters
Sanitary towels
Other bottles
Drinks bottles
Dairy packaging
Lids and caps
Boxes and crates
Fishing nets

3 highest leakage contributors in absolute OR relative value

Highest leakage contributors in absolute AND relative value

Quality Score



Key take-aways

- **Plastic bags** are by far the highest contributors in absolute leakage (4.9 kt) and rank 2nd in leakage rate (20%). They are highly harmful to marine life.
- **Baby diapers** are the 2nd highest contributor in absolute leakage (1.6 kt) and rank 3rd in leakage rate (13%). **Sanitary towels** have a similar leakage rate.
- **Other bottles** are 3rd in absolute leakage (0.9kt).
- Although **cigarette filters** ranks low in absolute leakage (0.3 kt), more than 1/5th of its waste generated leaks into the oceans.

*The impact assessment uses data from the coastal clean-up report from *Ocean Conservancy (2019)*

All applications

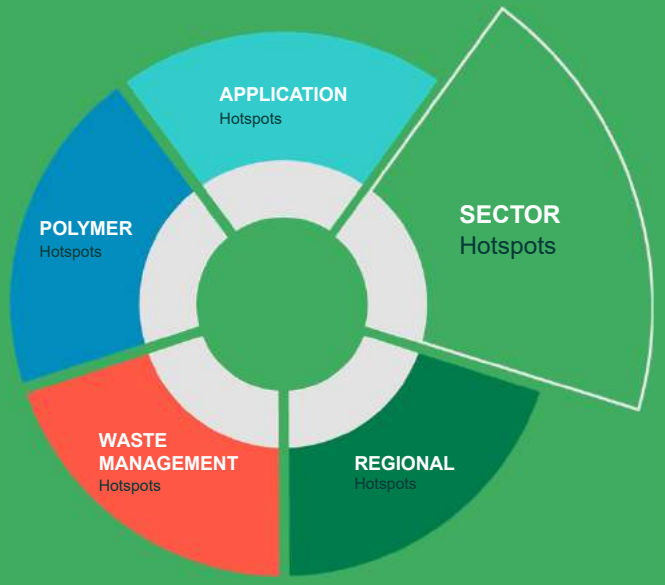
Limitations

We found no data available on production quantities by applications type in Mozambique. The production quantities have been estimated using the assumption that the relative importance in the country production was reflected in the relative importance in trade. With this approach, more than 50% of the leakage by application is grouped under “Other packaging”, meaning that we lack insight on which applications are most used and are consequently most problematic for the country.

Unlocking limitations

Collect information on consumption quantities by packaging application in Mozambique, either by contacting retailers or by conducting a consumer survey.

C SECTOR HOTSPOTS

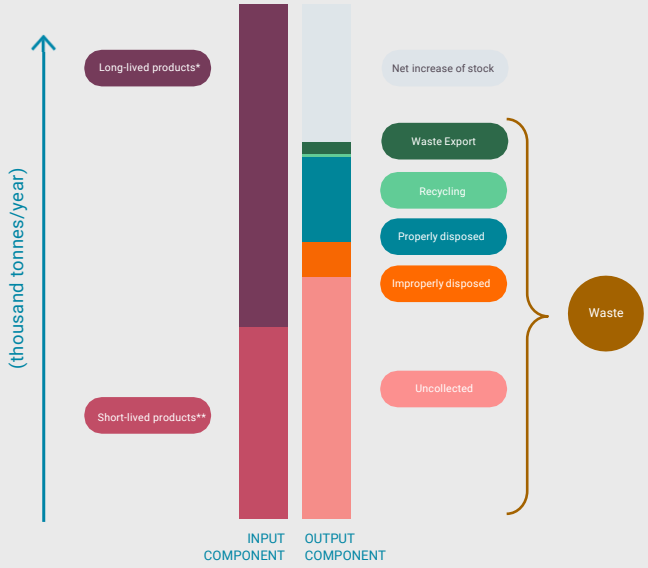


OBJECTIVE AND INSTRUCTIONS

Key question answered:

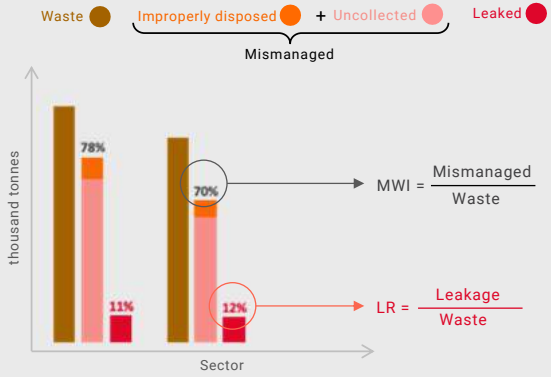
Which sectors are most critical in the country regarding plastic leakage?

What are the bar components of the sector mass balance graph?

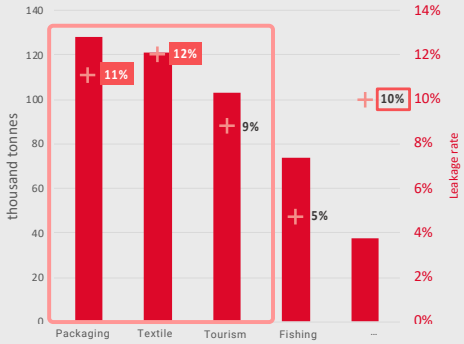


How to read the sector hotspot graph?

1. Determine leakage from mismanaged waste

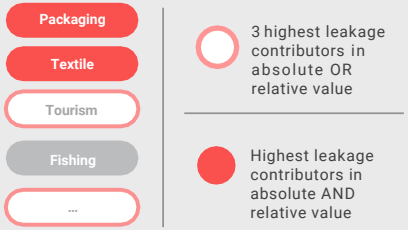


2. Focus on leakage and leakage rate

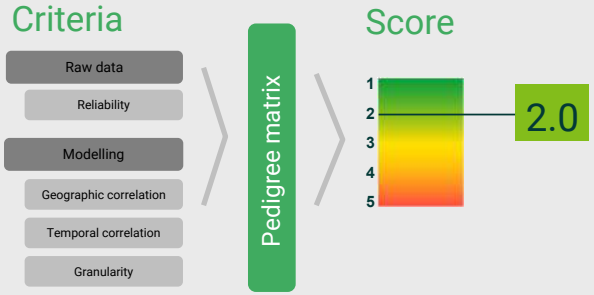


For more details, please read the Methodology

3. Select hotspots based on absolute and relative leakage

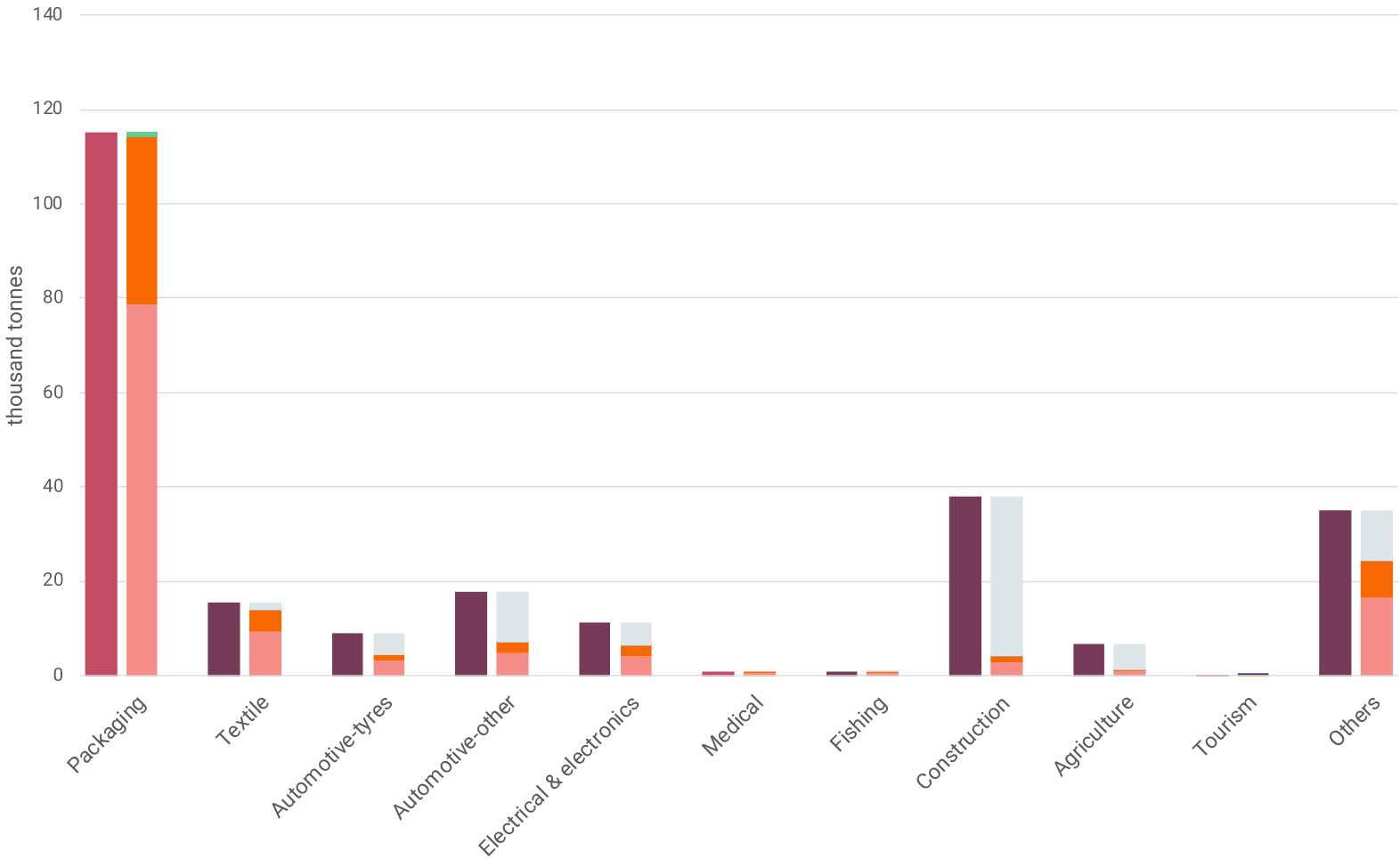


4. Assess the quality score of the results

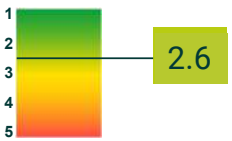


* **Short-lived products:** products that are disposed within the year of study (Life-time < 1 year)
** **Long-lived products:** products that are disposed after the year of study (Life-time > 1 year)

MASS BALANCE BY SECTOR [2018]



Quality Score



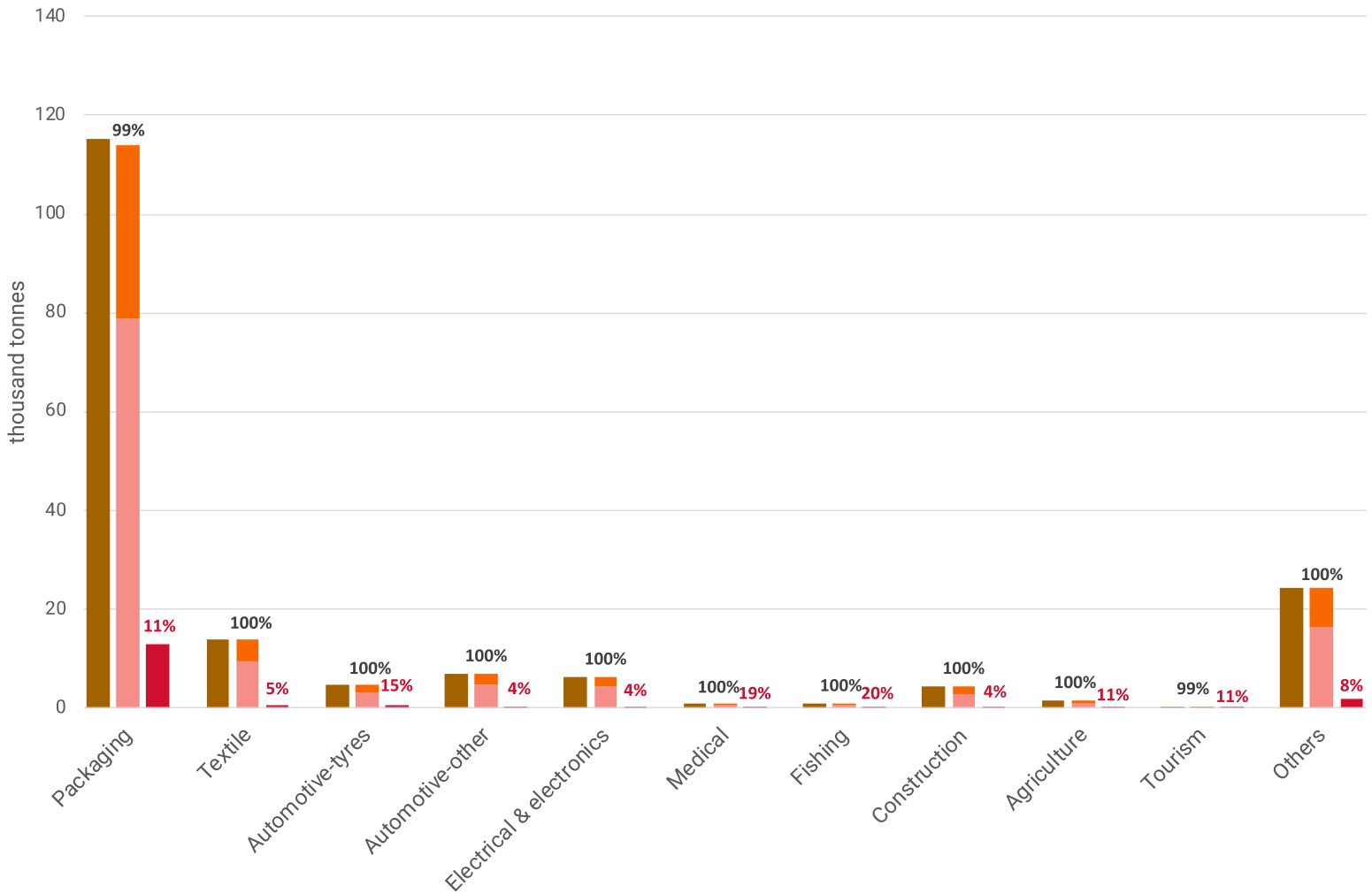
INPUT

- Short-lived products
- Long-lived products

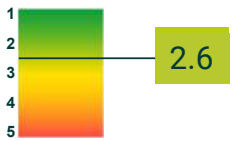
OUTPUT

- Charge in stock
- Waste Export
- Export of primary and products
- Recycling
- Properly disposed
- Improperly disposed
- Uncollected

MISMANAGED WASTE AND LEAKAGE BY SECTOR [2018]



Quality Score



Domestic waste

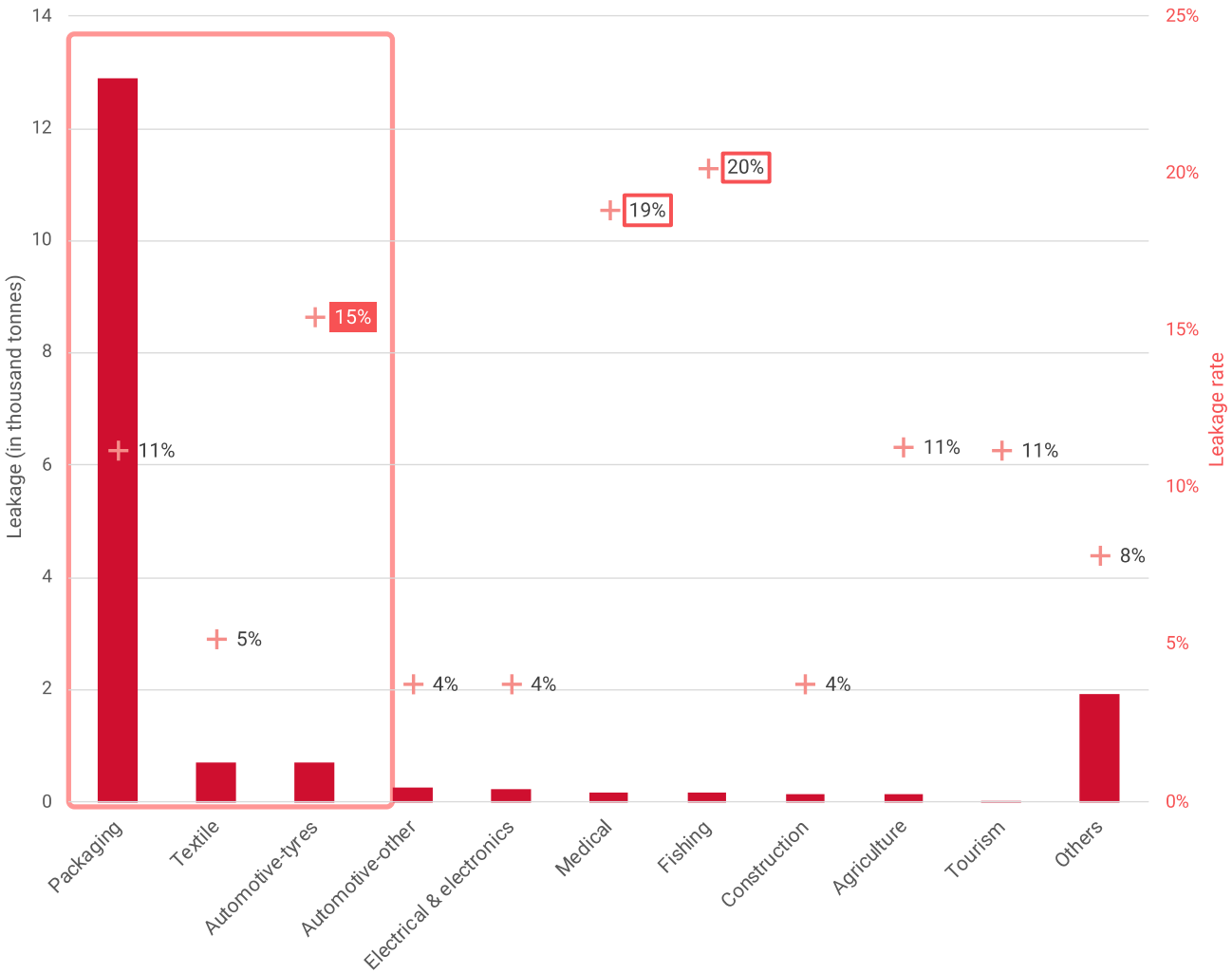
Improperly disposed + Uncollected = Mismanaged

Leaked

X% | Mismanaged Waste Index (MWI)

X% | Leakage Rate (LR)

SECTOR HOTSPOTS [2018]

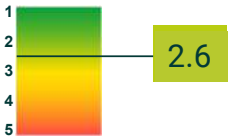


Automotive-tyres
Packaging
Textile
Fishing
Medical
Tourism
Agriculture
Electrical & electronics
Automotive-other
Construction

3 highest leakage contributors in absolute OR relative value

Highest leakage contributors in absolute AND relative value

Quality Score



Key take-aways

- **The packaging sector** contributes to more than 70% of the total plastic leakage with 12.9 kt of packaging waste leaking into oceans and waterways.
- The **textile** and **automotive-tyres** sectors are the 2nd and 3rd highest contributors to plastic leakage in absolute value (0.7 kt each).
- **Fishing** and **medical** sectors have a low contribution in absolute leakage but have very high leakage rates (respectively 20% and 19%).

SECTOR HOTSPOTS:
INTERPRETATION AND LIMITATIONS

Packaging

Learnings

Packaging is the sector with the highest absolute leakage, higher than all other sectors combined. This is due to various reasons. Firstly, packaging is the sector with the highest plastic consumption and, unlike other sectors, all of the products in the packaging sector become waste within a year (no stock). Secondly, although almost all plastics collected for recycling in Mozambique come from the packaging sector, this represents less than 1% of the entire plastic packaging production. Thirdly, plastic in packaging has one of the highest chances of littering as it includes the on-the-go product category.

Textile

Learnings

Textile is the second sector by absolute leakage, the plastic embedded in textile is not recycled, but the overall relative leakage is smaller because of lower chance of littering and lower release rate with regard to packaging.

Automotive-tyres

Learnings

The automotive-tyres sector is the third sector by absolute leakage and by relative leakage. The high relative leakage is due to the micro-leakage coming from tyre abrasion.

Limitations

We did not consider any special treatment for Automotive-tyres waste. In some countries, used tyres are turned into fuel in cement factories' kilns (properly disposed), but we are not aware of any such practice in Mozambique.

Unlocking limitations

Contact cement factories to know if and how many tyres they incinerate as fuel per year.

SECTOR HOTSPOTS:
INTERPRETATION AND LIMITATIONS

Medical

Learnings

Medical waste has a high relative leakage but a low absolute leakage.

Limitations

The high relative leakage is most likely not accurate, as we do not assume that there is a special treatment of medical waste, as should be the case in most countries, with the majority of the medical waste being incinerated. We assume instead that medical waste is managed as normal waste, and since it is contaminated it has low value for recyclers. We are nonetheless confident that plastic medical waste is orders of magnitude lower than packaging plastic waste, thus less critical for what concerns plastic leakage.

Unlocking limitations

Contact local hospitals to know if medical waste is incinerated.

Fishing

Learnings

The fishing sector has the highest relative leakage. Leakage from fishing includes: leakage from gear loss at sea, leakage from overboard littering of packaging, and leakage from fishing gear mismanaged on land. The national census on artisanal fishing gears (*MIMAIP, 2012*) identifies not only legal but also some illegal gears (chicocota, quinia). Mozambique is the only country for which we could assess illegal fishing practices.

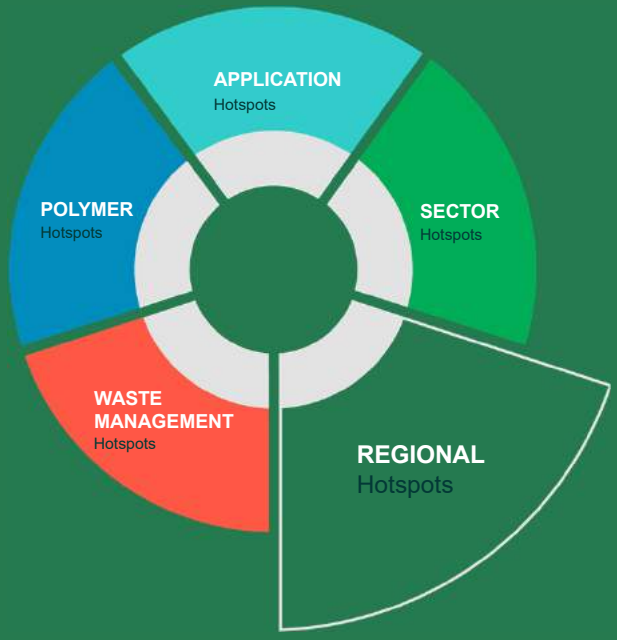
Limitations

- The census does not cover all the gears in operation as it mostly reports artisanal fishing gears and does not assess the gears used by commercial boats fishing in the territorial waters of Mozambique. Nonetheless, we are confident that plastic waste from fishing gears still remain orders of magnitude lower than packaging plastic waste, thus less critical for what concerns plastic leakage.
- We assume by default that fishermen litter overboard twice as much as people litter on land.

Unlocking limitations

- Perform a census on commercial fishing gears.
- Perform a littering survey among artisanal and commercial fishermen.

D REGIONAL HOTSPOTS

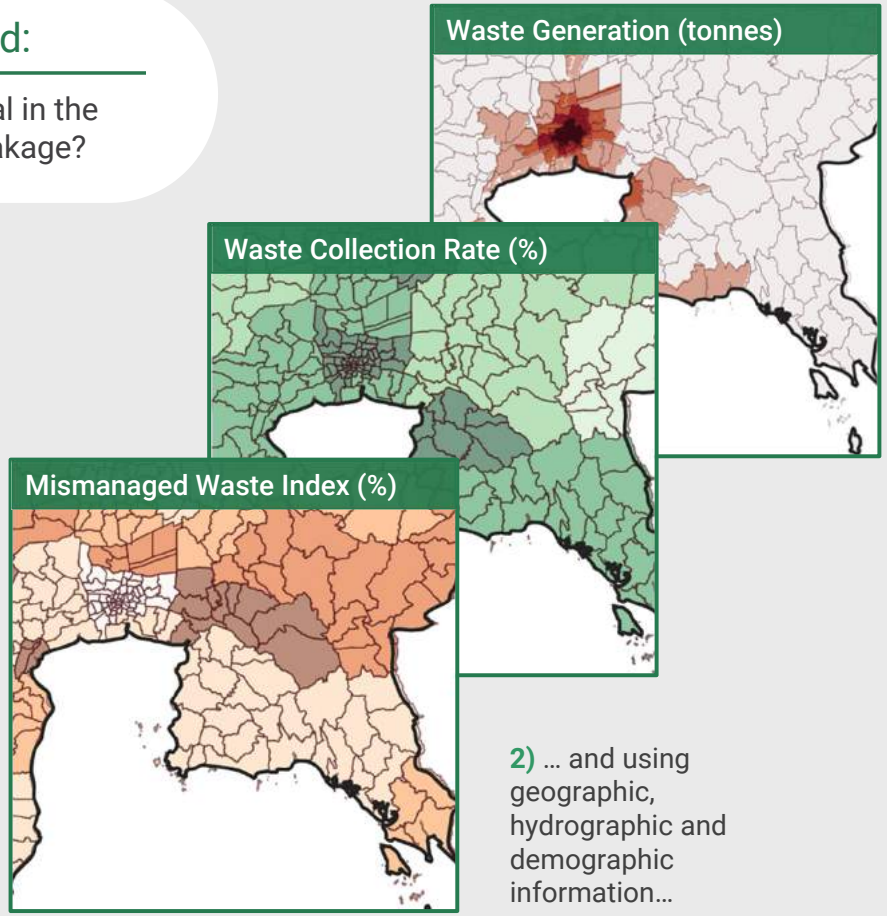


OBJECTIVE AND INSTRUCTIONS

Key question answered:

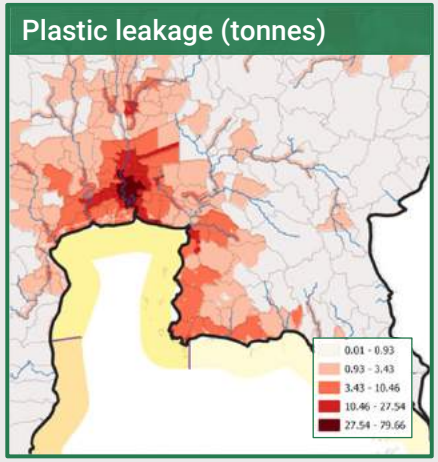
Which areas are most critical in the country regarding plastic leakage?

1) Overlaying different information available at city / district / sub-district level and/of modelled through archetypes…

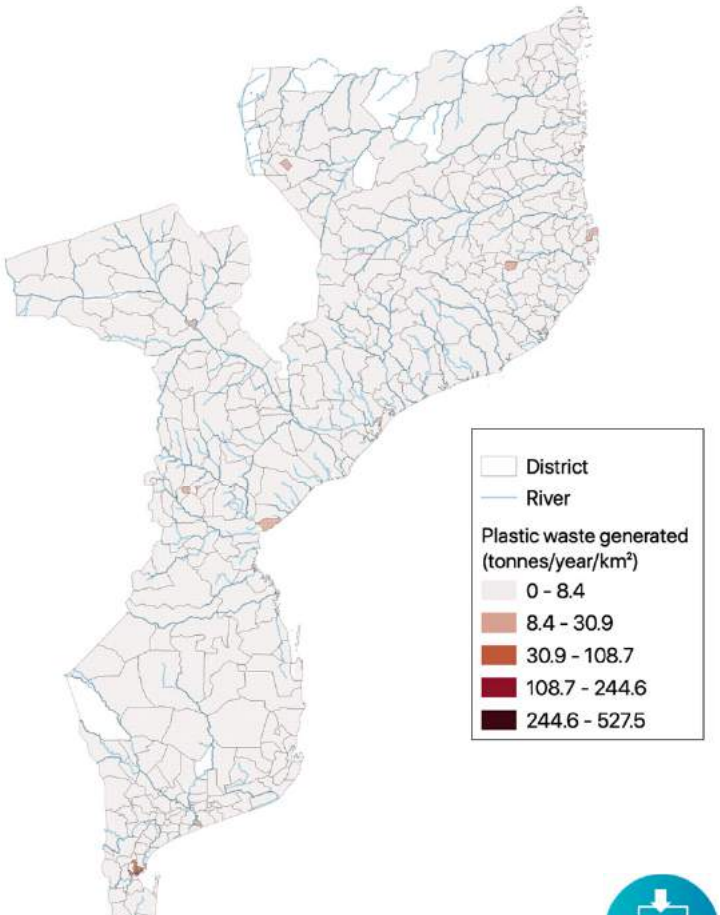


2) … and using geographic, hydrographic and demographic information…

3) … allows to compute a leakage map and identify regional hotspots



WASTE GENERATION:
MAP AND INTERPRETATIONS



More details available in Appendices

Key take-aways

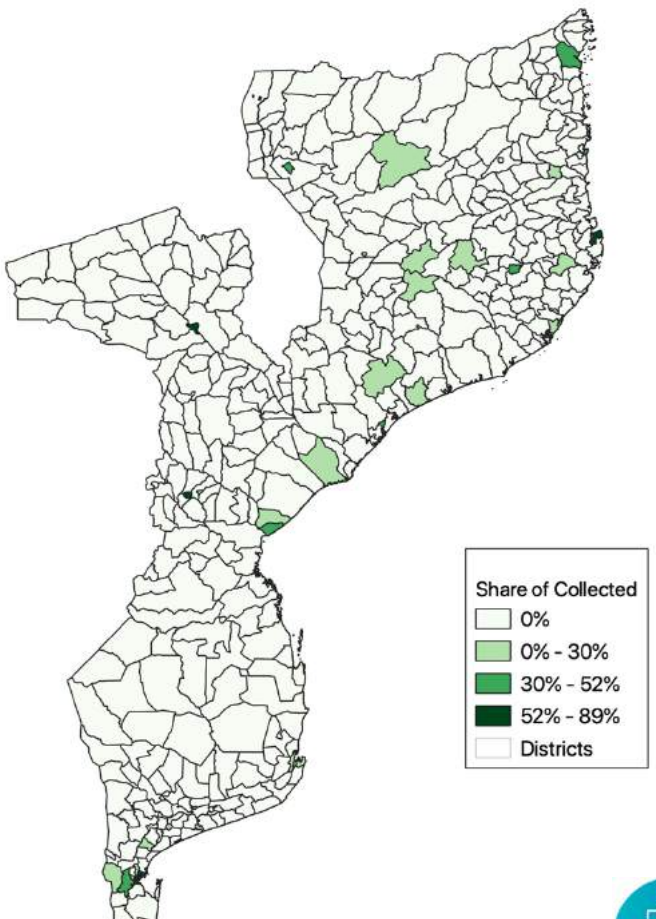
- Plastic waste generation is concentrated around the main cities.
- Depending on the urban area, from 4% to 8% of the waste generated is plastics.

Learnings

Per capita generation of plastic waste for urban areas is based on waste characterisation and generation study for the city of Nampula (*Vaz et al., 2018c*), and is adapted to include non-household waste and hidden plastic waste. This results in 15 kg of plastic waste generated per person per year in urban areas. The per capita plastic waste generation in rural areas is defined by matching the total plastic waste generation in Mozambique with the one determined by the sector hotspot analysis (2.2 kg/cap/year).

Waste collection data obtained from the Municipality of Maputo indicate that in Maputo, the per-capita plastic waste generation is higher than 15 kg/cap/year (average value for urban areas). Hence, we assume that the plastic waste generation in Maputo is similar to the one in Kenyan cities (*IUCN-EA-QUANTIS, 2020*), amounting to 30 kg/cap/year. This figure is in agreement with the waste management data for Maputo by *JICA, 2017*.

WASTE COLLECTION:
MAP AND INTERPRETATIONS



More details available in Appendices

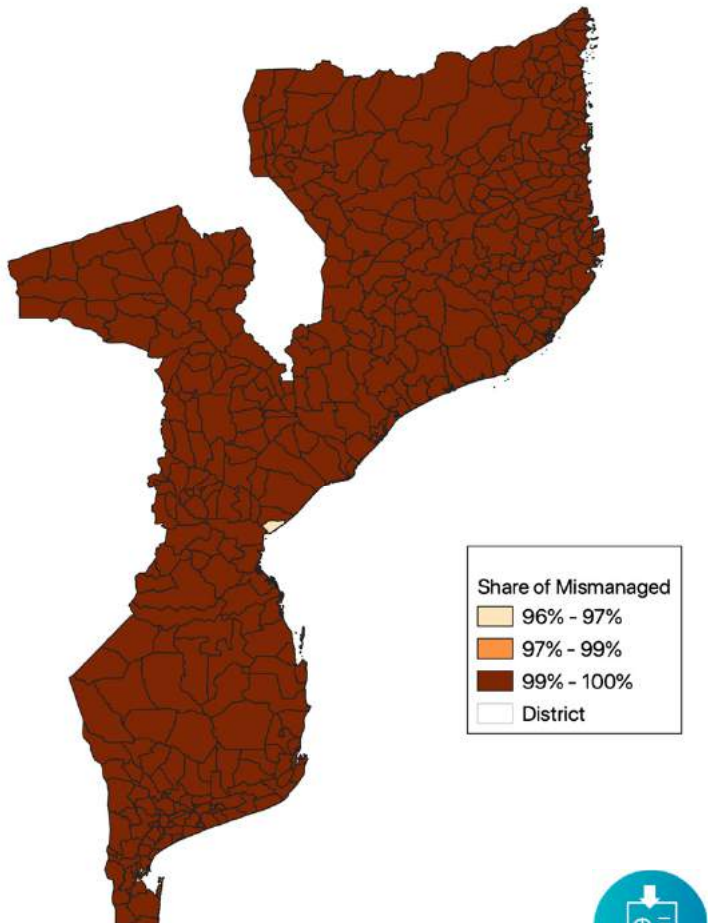
Key take-aways

- Waste collection effort is focused around of the waste is generated.
- There is no waste collection in rural area
- On average, 32% of the waste generated is collected.

Learnings

Waste collection quantities are estimated from the RSU ficha or from a study of the city when available (*Dias et al., 2017; Gonçalves et al., 2018; Vaz et al., 2018a/b/c*). The share of non-hidden plastic comes from studies that perform a detail waste characterisation of the cities. The share of hidden comes from textile, sanitary towels and diaper, e-waste, medical waste and multi-layer packaging (~23% of total plastic waste). For towns where a RSU ficha was not available, we used the lowest collection rate from the other cities (20%) which we applied to the waste generated. For Maputo we used data from the Municipality of Maputo.

MISMANAGED WASTE INDEX:
MAP AND INTERPRETATIONS



More details available in Appendices

Key take-aways

- MWI is above 97% everywhere in the country, due to the absence of sanitary landfill and incineration facilities.

Learnings

All plastic waste collected that is not recycled is considered mismanaged because it is not disposed in sanitary landfills nor incinerated in dedicated facilities.

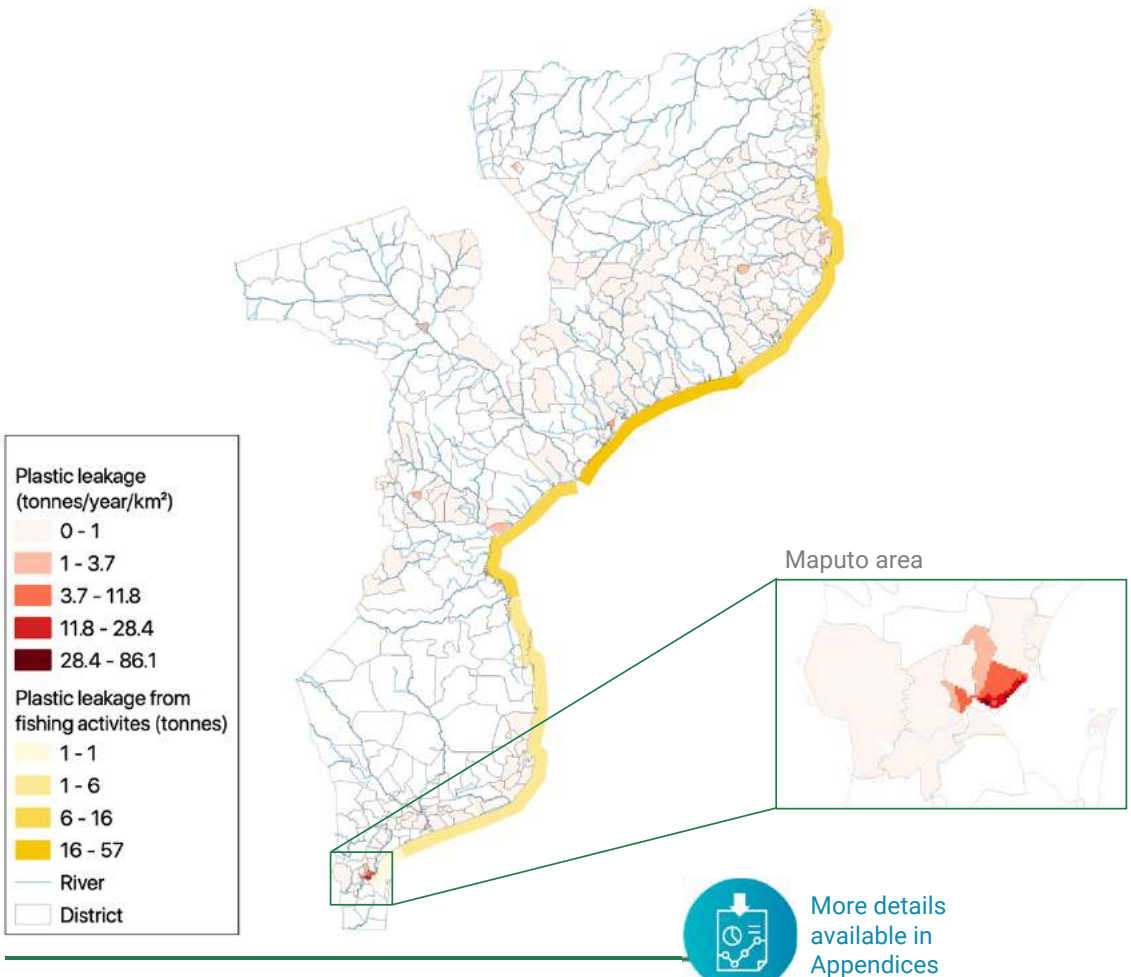
Limitations

We consider that recycling of plastic waste only happens in Beira and Maputo.

Unlocking limitations

Ask recycling actors if they also recycle plastic waste coming from other cities or areas in Mozambique.

REGIONAL LEAKAGE:
MAP AND INTERPRETATIONS



More details available in Appendices

Key take-aways

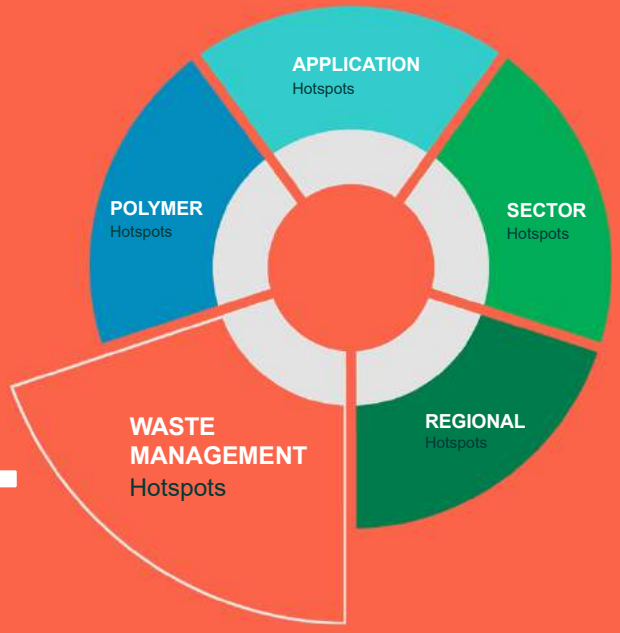
- Annual leakage of mismanaged waste: 16'347 t.
- Annual leakage from mismanaged/lost at sea fishing gears and from overboard litter: 141 t.
- The country leakage could be reduced by a third if all collected waste was properly disposed in sanitary landfills or incineration facilities.

Learnings

- The districts with the highest plastic leakage potential are: Maputo, Nampula and Dondo.
- Only 7 districts out of 128 contribute to 50% of the total plastic leakage.
- Plastic leakage from the fishing sector is much smaller than plastic leakage from mismanaged waste.
- The leakage is computed by multipling the waste mismanaged for each pixel (1km^2 grid), by its release rate (RR), which depends on the distance to closest shore or river and on the catchment runoff of its watershad. The average RR in Mozambique is 9.6%, meaning that 9.6% of mismanaged waste leaks into waterways.

E

WASTE MANAGEMENT HOTSPOTS



OBJECTIVE AND INSTRUCTIONS

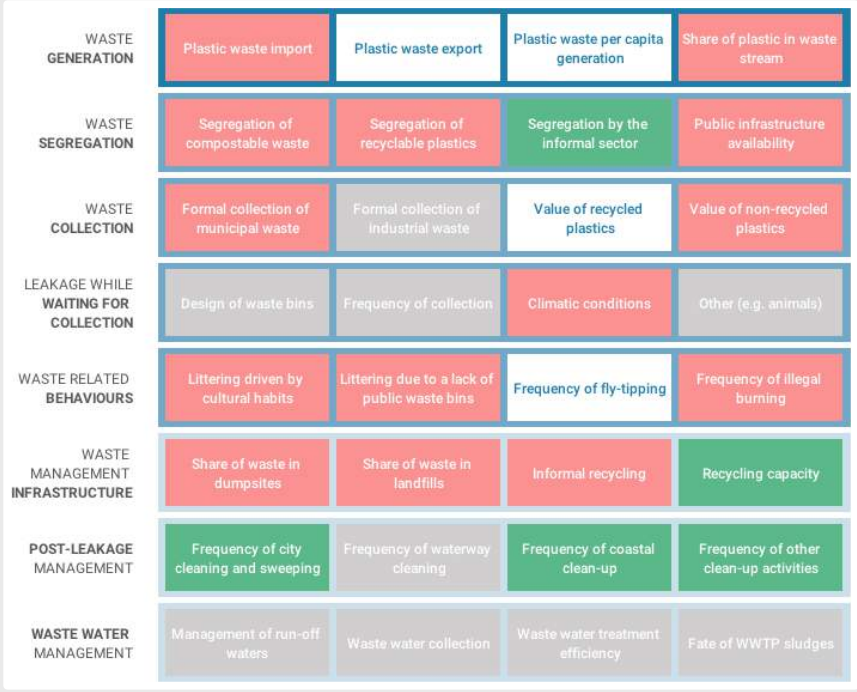
Key question answered:

Which waste management stages are most critical in the country regarding plastic leakage?

1) We decided for each element* of the waste management system if its contribution to leakage mitigation is positive (coolspot), neutral or negative (hotspot)

Waste management stage	Potential hotpsot	Is it a hotspot?	Justification	Source
Waste generation	Plastic waste import	HOTSPOT	Only 7% of the waste recycled in the country is locally sourced, the remaining 93% is imported. The formal sector only recycles imported waste (around 850kt a year) and it does not recycled domestic waste (cit. VPA, VCCI). Domestic waste is recycled by the informal sector in improper conditions.	VPA interview and VCCI report VN_r14
	Plastic waste export			
	Plastic waste per capita generation		Vietnam produces around 50 kg of plastic waste per person per year	EA - Country baseline analysis
	Share of plastic in waste stream	HOTSPOT	Vietnam is a LMC (8% of plastic in waste stream on average), but the share of plastic in the waste stream is from 15% to 20% depending on the source	VN_r10 GA Circular summarises the waste characterisation studies

2) Understand at a glance the status of the waste management system in the country with this dashboard



*For detailed element descriptions and methodology, refer to tool T4.1

WASTE MANAGEMENT HOTSPOTS

SOURCE	WASTE **GENERATION**	Plastic waste import	Plastic waste export	Plastic waste per capita generation	Share of plastic in waste stream
COLLECTION	WASTE **SEGREGATION**	Segregation of compostable waste	Segregation of recyclable plastics	Segregation by the informal sector	Public infrastructure availability
	WASTE **COLLECTION**	Formal collection of municipal waste	Formal collection of industrial waste	Value of recycled plastics	Value of non-recycled plastics
	LEAKAGE WHILE **WAITING FOR COLLECTION**	Design of waste bins	Frequency of collection	Climatic conditions	Other (e.g. animals)
	WASTE RELATED **BEHAVIOURS**	Littering driven by cultural habits	Littering due to a lack of public waste bins	Frequency of fly-tipping	Frequency of illegal burning
END-OF-LIFE	WASTE MANAGEMENT **INFRASTRUCTURE**	Share of waste in dumpsites	Share of waste in unsanitary landfills	Informal recycling	Recycling capacity
	POST-LEAKAGE MANAGEMENT	Frequency of city cleaning and sweeping	Frequency of waterway cleaning	Frequency of coastal clean-up	Frequency of other clean-up activities
	WASTE WATER MANAGEMENT	Management of run-off waters	Waste water collection	Waste water treatment efficiency	Fate of WWTP sludges

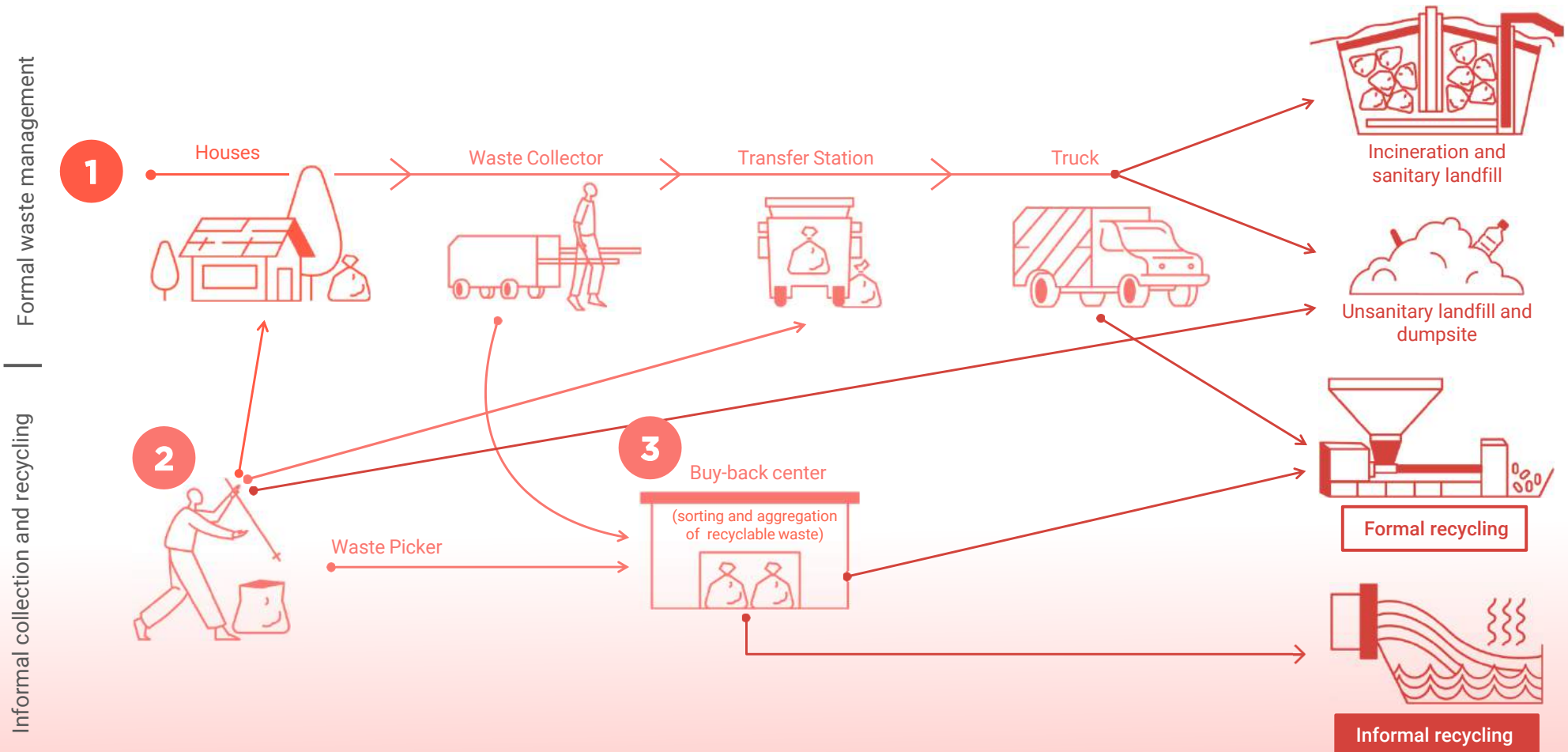
- **Negative contribution to the leakage**
- **Neutral contribution**
- **Positive contribution**
- **Not assessed**

*For more details and justifications, please check tool T4.1

Key take-aways

- Plastic waste per capita is low but plastic share in waste stream is high for a low-income country.
- Lack of waste segregation at source hinders recycling potential.
- The value of plastic waste is too low to incentivise informal collection.
- Areas prone to flooding are likely to highly contribute to leakage.
- Lack of waste collection services and absence of waste bins in peri-urban areas drive littering and burning behaviours.
- There are no sanitary landfills nor incineration facilities, leading to mismanagement of collected waste.
- There is a lack of recycling capacity.
- There is a lack of waste water treatment.

PLASTIC WASTE JOURNEY IN PICTURES



1

Transfer stations

Fly-tipping

Transport to landfill

Landfill

2

Street waste-pickers

Landfill waste-pickers

3

Plastic for recycling

2.3 ACTIONABLE HOTSPOTS

HOTSPOTS IN BRIEF

Polymer

- PET
- PP
- LDPE
- Synthetic Rubber
- HDPE
- PS
- Polyester
- PVC
- Other

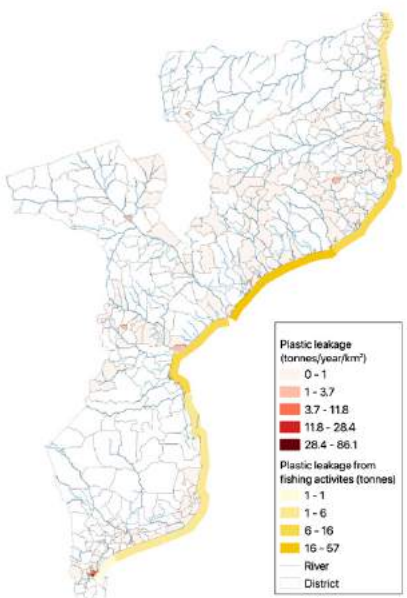
Application

- Bags
- Baby diapers
- Cigarette filters
- Sanitary towels
- Other bottles
- Drinks bottles
- Dairy packaging
- Lids and caps
- Boxes and crates
- Fishing nets

Sector

- Automotive-tyres
- Packaging
- Textile
- Fishing
- Medical
- Tourism
- Agriculture
- Electrical & electronics
- Automotive-other
- Construction

Regional



Waste management

3 highest leakage contributors in absolute OR relative value

Highest leakage contributors in absolute AND relative value

Negative contribution to the leakage

Neutral contribution

Positive contribution

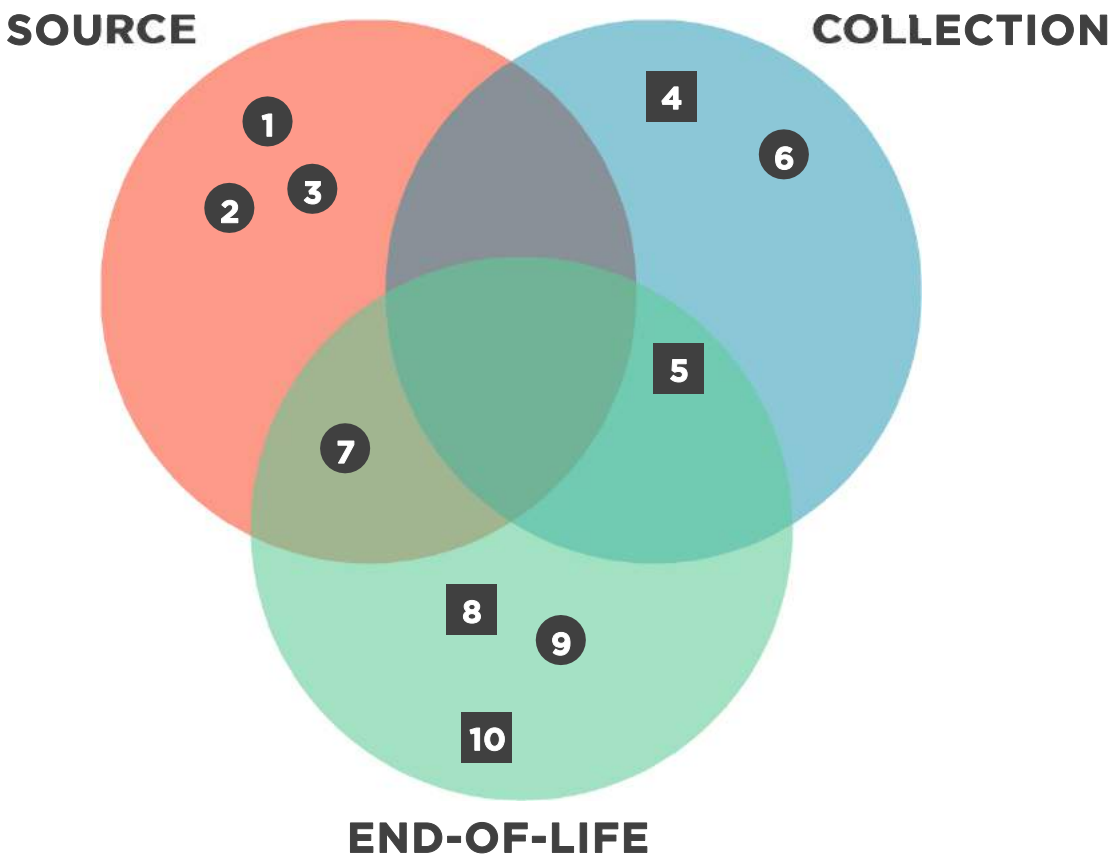
Not assessed

ACTIONABLE HOTSPOTS LIST

[#]	[ACTIONABLE HOTSPOT]	[■/●]
1	PET and PP leak because of high consumption compared to other polymers.	●
2	Plastic leakage occurs mostly in coastal areas because it accounts for a large part of the Mozambique population and the waste can more easily find its way to the sea.	●
3	Packaging is a key sector in Mozambique that consumes more plastic than all other sectors combined and contributes to 70% of plastic leakage.	●
4	All plastics leak due to low collection rates in Mozambique.	■
5	All plastics leaks in Mozambique because of lack of segregation of waste at source, which makes plastic less likely to be recycled.	■
6	Plastic leaks because of a lack of proper waste infrastructure and insufficient collection services, especially in peri-urban areas.	●
7	Plastic leaks into the ocean due to flooding events in large areas close to the sea where street clean-ups are not performed regularly.	●
8	Absence of sanitary landfills in Mozambique means that waste mismanagement is very high (more than 96%), thus strongly driving plastic leakage.	■
9	Low recycling rates and recycling capacities for many polymers, especially for PP and LDPE, increases risk of leakage in the country.	●
10	Burning of waste reduces the amount of potentially recyclable plastic.	■

■ **GENERIC**(Concerns all plastic types and all regions) ● **SPECIFIC**(Concerns specific plastic types and all regions)

ACTIONABLE HOTSPOTS CHARACTERISATION



Each actionable hotspot can address plastic pollution at one or multiple stages along the plastic value chain. We notice that the list of actionable hotspots for Mozambique calls for a well-balanced set of actions across the value chain, yet with an emphasis on the end-of-life (proper management of waste after collection).

GENERIC (Concerns all plastic types and all regions)

SPECIFIC (Concerns specific plastic types or regions)

3 SHAPING ACTION

3.1 INTERVENTIONS

METHODOLOGY FOR IDENTIFYING INTERVENTIONS

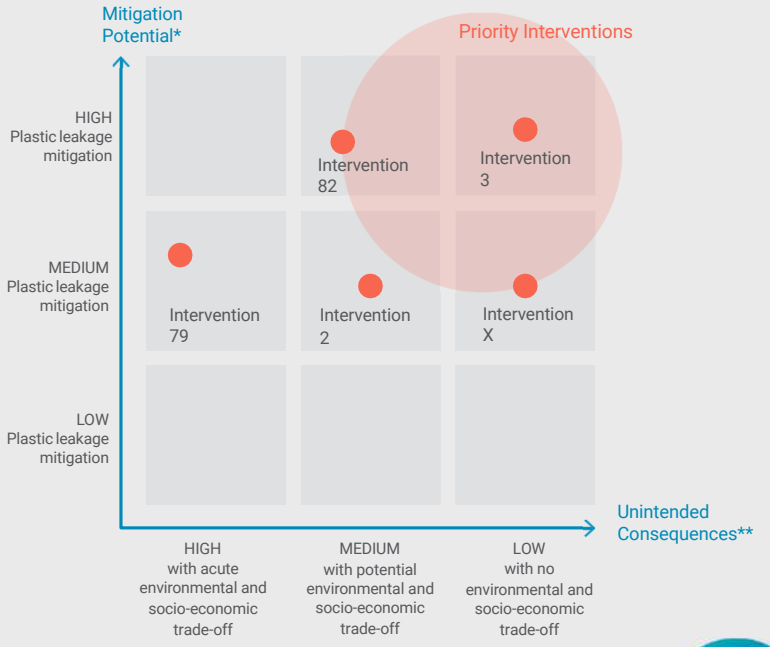
STEP 1: choose up to 3 interventions for each actionable hotspot

STEP 2: assess criteria levels for each chosen intervention

Actionable hotspots (AH)
AH 1
AH 2
AH 3
...
AH x

Interventions (I)	Leakage mitigation potential*	Unintended consequences**
I1		
I2	medium	medium
I3	high	low
I4		
I5		
...		
I79	medium	high
I80		
I81		
I82	high	medium
I83		

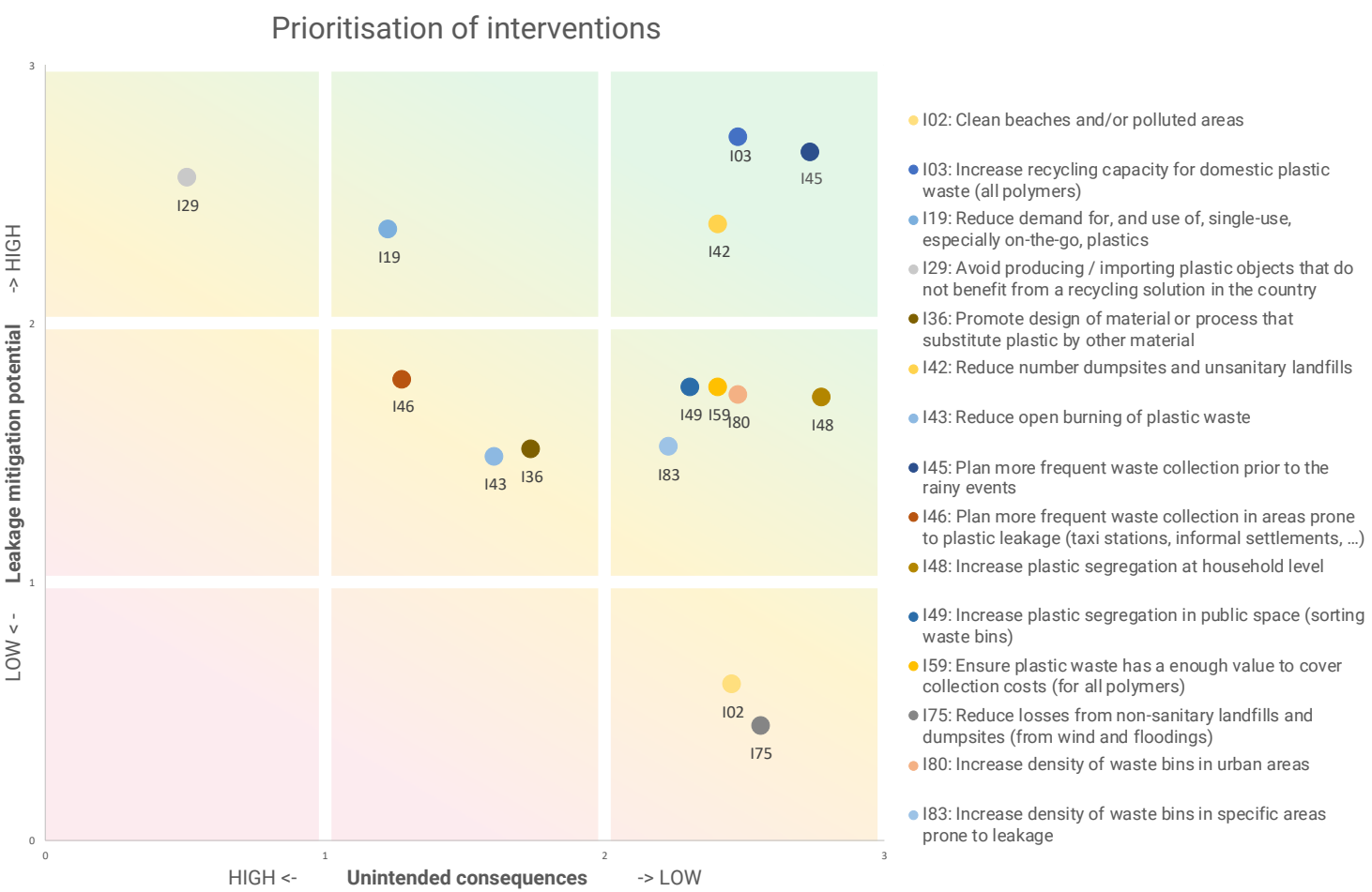
STEP 3: visualise priority interventions in the top right corner of the chart



* **Leakage mitigation potential:** high mitigation potential actions are those that contribute to meaningful reductions of plastic leakage and impacts.
** **Unintended consequences:** highly consequential actions are those most likely to generate unintended environmental or socio-economic trade-offs (e.g., substitution from plastic to another material may generate additional environmental impacts such as GHG emissions).

S2

PRELIMINARY SELECTION OF INTERVENTIONS



- I02: Clean beaches and/or polluted areas
- I03: Increase recycling capacity for domestic plastic waste (all polymers)
- I19: Reduce demand for, and use of, single-use, especially on-the-go, plastics
- I29: Avoid producing / importing plastic objects that do not benefit from a recycling solution in the country
- I36: Promote design of material or process that substitute plastic by other material
- I42: Reduce number dumpsites and unsanitary landfills
- I43: Reduce open burning of plastic waste
- I45: Plan more frequent waste collection prior to the rainy events
- I46: Plan more frequent waste collection in areas prone to plastic leakage (taxi stations, informal settlements, ...)
- I48: Increase plastic segregation at household level
- I49: Increase plastic segregation in public space (sorting waste bins)
- I59: Ensure plastic waste has a enough value to cover collection costs (for all polymers)
- I75: Reduce losses from non-sanitary landfills and dumpsites (from wind and floodings)
- I80: Increase density of waste bins in urban areas
- I83: Increase density of waste bins in specific areas prone to leakage

Learning

Points are randomly distributed within the designated box to avoid overlapping. Each box on this 9 facets grid corresponds to a couple low/low or low/medium or low/high, etc. Only the facet in which the point falls into should be accounted for, not its relative position to points nearby.

Limitations

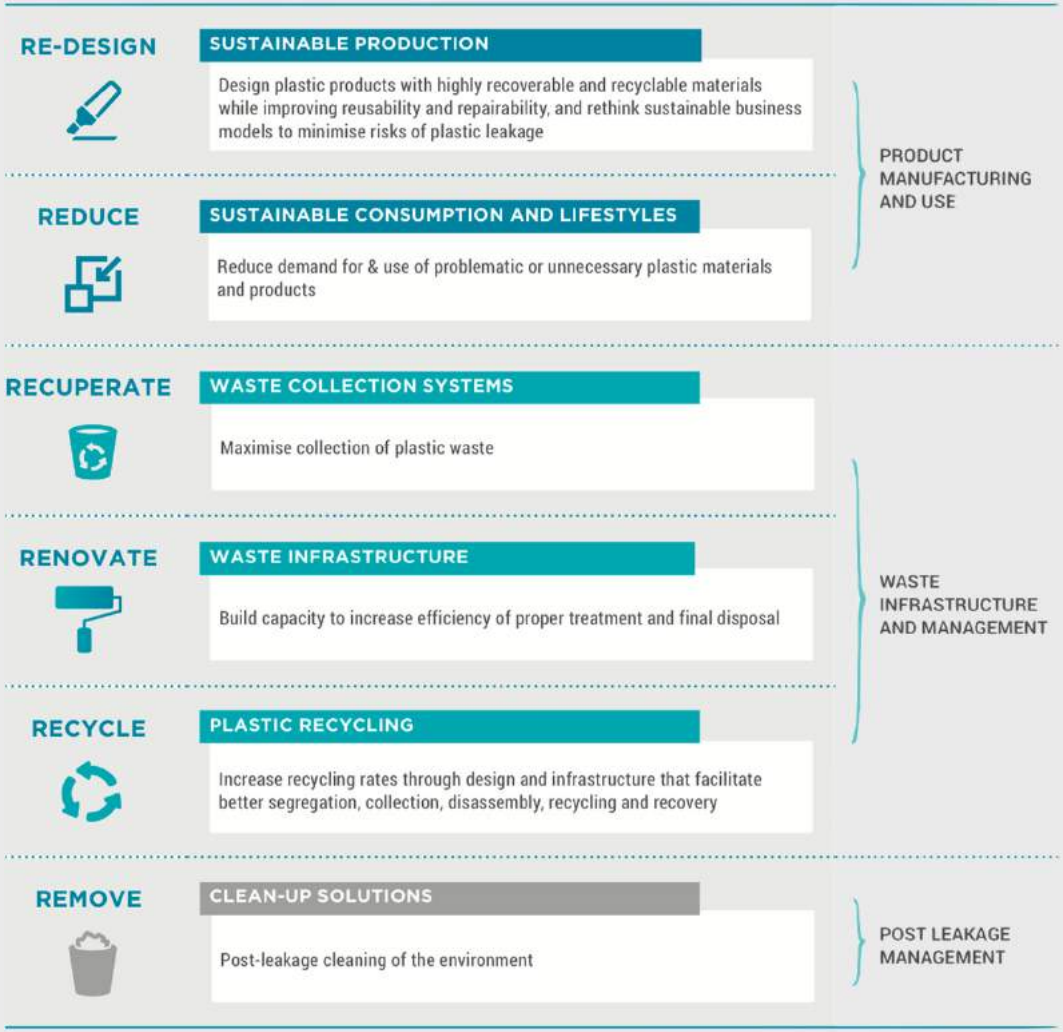
The list of interventions results from the hotspot analysis ; it is currently based on the author perception. A final version of the interventions should be elaborated through a multi-stakeholder consultation process.

Unlock button

Set up a workshop for a multi-stakeholder process and repeat the interventions selection procedure.

INTERVENTIONS CLASSIFICATION

Interventions may occur at any point along the value chain.
We categorise them into six types of approaches along the value chain.



S2

PRELIMINARY PRIORITY INTERVENTIONS LIST

[INTERVENTION CLASS]	[PRIORITY INTERVENTION]	[CODE]
SUSTAINABLE CONSUMPTION AND LIFESTYLES	Reduce demand for, and use of, single-use, especially on-the-go, plastics	**I19**
WASTE COLLECTION SYSTEMS	Reduce the number of dumpsites and unsanitary landfills	**I42**
	Plan more frequent waste collection prior to the rainy events	**I45**
	Increase plastic segregation at household level	**I48**
	Increase plastic segregation in public spaces (sorting waste bins)	**I49**
	Ensure plastic waste has enough value to cover collection costs (for all polymers)	**I59**
WASTE INFRASTRUCTURE	Increase density of waste bins in urban areas	**I80**
	Increase density of waste bins in specific areas prone to leakage	**I83**
RECYCLING	Increase recycling capacity for domestic plastic waste (all polymers)	**I03**

3.2 INSTRUMENTS

METHODOLOGY FOR IDENTIFYING INSTRUMENTS

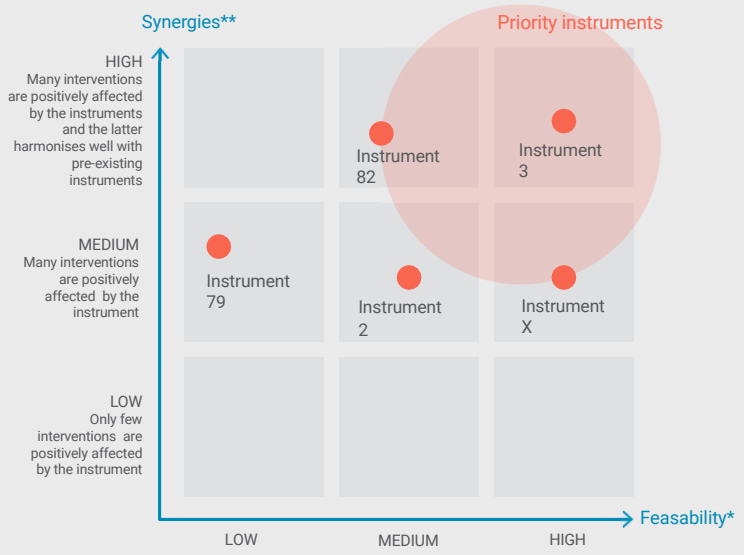
STEP 1: choose up to 3 instruments for each intervention selected in S2

STEP 2: assess criteria levels for each chosen instrument

STEP 3: visualise priority instruments in the top right corner of the chart

Intervention (I)
I2
I3
...
I79
I82

Instruments (J)	Feasability*	Synergies**
J1		
J2	medium	medium
J3	high	high
J4		
J5		
...		
J79	medium	low
J80		
J81		
J82	high	medium
J83		

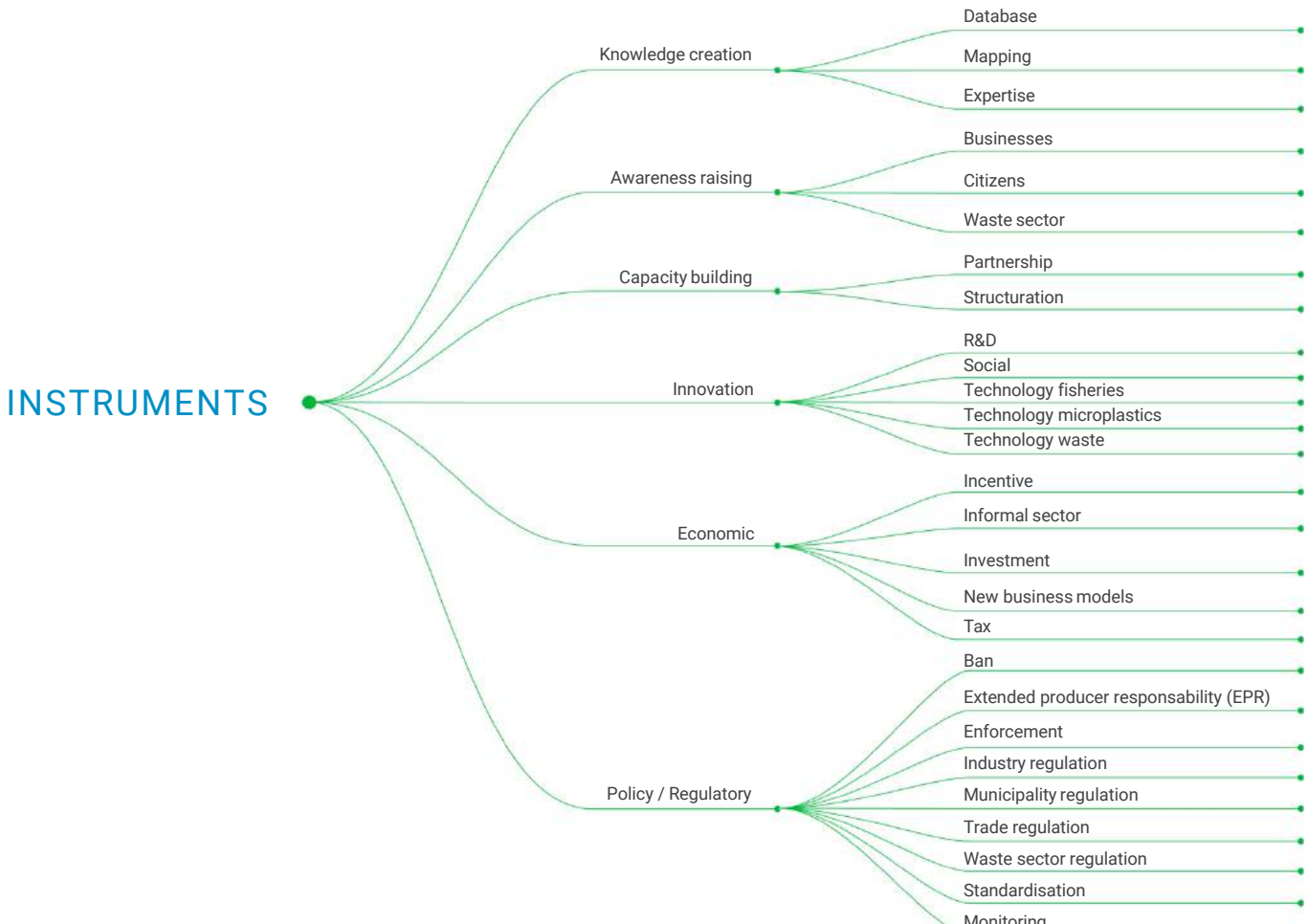


* **Feasability:** technical and socio-economic assessment of each instrument should be performed. We do not assert a method to perform the assessment as this is beyond the scope of the Guidance. The user can decide on the method to use based on resources available. A by default qualitative assessment with three levels is suggested.

** **Synergies**: Some instruments may be beneficial to multiple interventions, thus creating a positive synergetic effect. This criterion does not only evaluate the number of suggested interventions benefitting from an instrument, but also assess if the proposed instrument harmonises well with instruments already in place.

S3

LIST OF POSSIBLE INSTRUMENT CATEGORIES



S3

4 APPENDICES

4.1 DATA REPOSITORY

DETAILED SHARES BY POLYMER

Polymer Type	Waste produced in country	Domestic recycling of collected	Export of collected	Properly disposed	Improperly disposed	Uncollected	*Tot*	Collected	Mismanaged	Leaked	Waste produced and imported	Domestic recycling incl imported
PET	*45*	2%	0%	0%	38%	60%	*100%*	40%	98%	13%	*47*	5%
PP	*35*	0%	0%	0%	30%	70%	*100%*	30%	100%	9%	*35*	0%
Polyester	*12*	0%	0%	0%	36%	64%	*100%*	36%	100%	6%	*12*	0%
LDPE	*27*	0%	0%	0%	33%	66%	*100%*	34%	100%	11%	*27*	1%
HDPE	*27*	2%	0%	0%	31%	68%	*100%*	32%	98%	10%	*28*	5%
PS	*3*	0%	0%	0%	24%	76%	*100%*	24%	100%	8%	*3*	0%
Other	*22*	0%	0%	0%	26%	74%	*100%*	26%	100%	6%	*22*	0%
Synthetic Rubber	*5*	0%	0%	0%	29%	71%	*100%*	29%	100%	15%	*5*	0%
PVC	*6*	0%	0%	0%	14%	86%	*100%*	14%	100%	4%	*6*	0%
Average	*20*	*0%*	*0%*	*0%*	*29%*	*71%*	*100%*	*29%*	*100%*	*9%*	*20*	*1%*

- **Waste** = Collected + Uncollected
- **Collected** = Domestic recycling of collected + Export of collected + Properly disposed + Improperly disposed
- **Mismanaged** = Improperly disposed + Uncollected

WASTE MANAGEMENT BY MUNICIPALITY

Municipality	Population 2020	Generated t	Collected t	Collected for recycling t	Properly disposed t	Improperly disposed t	Uncollected t	Leaked t	Generated kg/hab	Collected for recycling kg/hab	Mismanaged kg/hab	Share of collected	Share of mismanaged
Pemba	244440	3167	1318	0	0	1318	1849	209	13.0	0	13.0	42%	100%
Mocimboa da Praia	84172	1220	631	0	0	631	589	90	14.5	0	14.5	52%	100%
Chiure	31626	458	92	0	0	92	367	49	14.5	0	14.5	20%	100%
Xai-Xai	130266	2242	448	0	0	448	1794	254	17.2	0	17.2	20%	100%
Maxixe	125324	1816	363	0	0	363	1453	192	14.5	0	14.5	20%	100%
Inhambane	75223	1297	234	0	0	234	1063	105	17.2	0	17.2	18%	100%
Chimoio	347517	5738	4094	0	0	4094	1644	574	16.5	0	16.5	71%	100%
Gondola	44532	645	129	0	0	129	516	65	14.5	0	14.5	20%	100%
Namaacha	44225	641	128	0	0	128	513	33	14.5	0	14.5	20%	100%
Manhica	83725	1214	243	0	0	243	971	62	14.5	0	14.5	20%	100%
Boane	139071	2016	771	0	0	771	1245	113	14.5	0	14.5	38%	100%
Maputo	1182893	32408	24292	859	0	23433	8116	2613	27.4	0.73	26.7	72%	97%
Matola	1182515	16301	3260	0	0	3260	13040	943	13.8	0	13.8	20%	100%
Ribaue	151940	2202	440	0	0	440	1762	225	14.5	0	14.5	20%	100%
Monapo	171719	2489	498	0	0	498	1991	259	14.5	0	14.5	20%	100%
Malema	134671	1952	390	0	0	390	1562	204	14.5	0	14.5	20%	100%
Ilha De Mocambique	40408	586	117	0	0	117	469	39	14.5	0	14.5	20%	100%
Nampula	819059	12005	3633	0	0	3633	8372	1201	14.7	0	14.7	30%	100%
Nacala Porto	266613	3864	3436	0	0	3436	428	371	14.5	0	14.5	89%	100%
Angoche	62732	909	182	0	0	182	727	89	14.5	0	14.5	20%	100%
Marrupa	66989	971	194	0	0	194	777	58	14.5	0	14.5	20%	100%
Macia	54222	786	157	0	0	157	629	50	14.5	0	14.5	20%	100%
Lichinga	266034	3825	1723	0	0	1723	2101	271	14.4	0	14.4	45%	100%
Marromeu	145768	2113	423	0	0	423	1690	225	14.5	0	14.5	20%	100%
Dondo	117822	1708	342	0	0	342	1366	179	14.5	0	14.5	20%	100%
Beira	468742	9350	4645	341	0	4305	4705	897	19.9	0.73	19.2	46%	96%
Tete	263238	4854	2986	0	0	2986	1868	574	18.4	0	18.4	62%	100%
Alto Molocue	287152	4162	832	0	0	832	3330	413	14.5	0	14.5	20%	100%
Maganja da Costa	125781	1823	365	0	0	365	1458	194	14.5	0	14.5	20%	100%
Quelimane	256436	3717	1278	0	0	1278	2439	408	14.5	0	14.5	34%	100%
Mocuba	250176	3626	725	0	0	725	2901	385	14.5	0	14.5	20%	100%
Other	23155874	50623	0	0	0	0	50623	5005	2.2	0	2.2	0%	100%

WASTE MANAGEMENT BY DISTRICT (1/4)

District	Population 2020	Generated t	Collected t	Properly managed t	Improperly managed t	Uncollected t	Mismanaged t	Leaked t	Generated kg/cap	Collected kg/cap	Mismanaged kg/cap	Share of Collected	Share of Mismanaged	Leakage rate
Alto Molocue	451 277	4 521	832	-	832	3 688	4 521	442	10	2	10	18%	100%	10%
Ancuabe	261 673	572	-	-	-	572	572	60	2	0	2	0%	100%	10%
Angoche	338 391	1 512	182	-	182	1 330	1 512	150	4	1	4	12%	100%	10%
Angonia	369 719	808	-	-	-	808	808	84	2	0	2	0%	100%	10%
Balama	167 658	367	-	-	-	367	367	37	2	0	2	0%	100%	10%
Barue	287 737	629	-	-	-	629	629	68	2	0	2	0%	100%	11%
Bilene	182 722	1 067	157	-	157	910	1 067	72	6	1	6	15%	100%	7%
Boane	223 028	2 199	771	-	771	1 428	2 199	122	10	3	10	35%	100%	6%
Buzi	182 471	399	-	-	-	399	399	42	2	0	2	0%	100%	11%
Cahora Bassa	151 161	330	-	-	-	330	330	34	2	0	2	0%	100%	10%
Caia	169 941	372	-	-	-	372	372	39	2	0	2	0%	100%	10%
Changara	490 210	5 350	2 986	-	2 986	2 364	5 350	626	11	6	11	56%	100%	12%
Chemba	90 046	197	-	-	-	197	197	21	2	0	2	0%	100%	11%
Cheringoma	65 928	144	-	-	-	144	144	15	2	0	2	0%	100%	10%
Chibabava	161 943	354	-	-	-	354	354	37	2	0	2	0%	100%	11%
Chibuto	241 743	528	-	-	-	528	528	57	2	0	2	0%	100%	11%
Chicualacuala	41 240	90	-	-	-	90	90	9	2	0	2	0%	100%	10%
Chifunde	256 462	561	-	-	-	561	561	60	2	0	2	0%	100%	11%
Chigubo	37 913	83	-	-	-	83	83	8	2	0	2	0%	100%	10%
Chinde	106 076	232	-	-	-	232	232	24	2	0	2	0%	100%	11%
Chiuta	129 386	283	-	-	-	283	283	30	2	0	2	0%	100%	11%
Chiure	174 966	772	92	-	92	680	772	83	4	1	4	12%	100%	11%
Chokwe	197 446	432	-	-	-	432	432	42	2	0	2	0%	100%	10%
Cuamba	305 467	668	-	-	-	668	668	70	2	0	2	0%	100%	10%
Dondo	647 939	11 192	4 987	341	4 646	6 205	10 852	1 091	17	8	17	45%	97%	10%
Erati	150 734	330	-	-	-	330	330	35	2	0	2	0%	100%	11%
Funhalouro	50 755	111	-	-	-	111	111	11	2	0	2	0%	100%	10%
Gile	259 593	568	-	-	-	568	568	54	2	0	2	0%	100%	10%
Gondola	782 840	7 238	4 223	-	4 223	3 015	7 238	727	9	5	9	58%	100%	10%
Gorongosa	199 100	435	-	-	-	435	435	47	2	0	2	0%	100%	11%
Govuro	43 276	95	-	-	-	95	95	9	2	0	2	0%	100%	10%
Guija	109 079	238	-	-	-	238	238	25	2	0	2	0%	100%	10%

Per capita values are calculated by dividing total values by the 2020 population forecasted by NASA in 2015.

WASTE MANAGEMENT BY DISTRICT (2/4)

District	Population 2020	Generated t	Collected t	Properly managed t	Improperly managed t	Uncollected t	Mismanaged t	Leaked t	Generated kg/cap	Collected kg/cap	Mismanaged kg/cap	Share of Collected	Share of Mismanaged	Leakage rate
Guro	115 885	253	-	-	-	253	253	26	2	0	2	0%	100%	10%
Gurue	514 851	1 126	-	-	-	1 126	1 126	116	2	0	2	0%	100%	10%
Homoine	256 873	2 104	363	-	363	1 741	2 104	220	8	1	8	17%	100%	10%
Ile	407 812	892	-	-	-	892	892	85	2	0	2	0%	100%	10%
Inharrime	131 687	288	-	-	-	288	288	29	2	0	2	0%	100%	10%
Inhassoro	58 424	128	-	-	-	128	128	13	2	0	2	0%	100%	10%
Inhassunge	90 701	198	-	-	-	198	198	17	2	0	2	0%	100%	8%
Jangamo	185 539	1 538	234	-	234	1 304	1 538	129	8	1	8	15%	100%	8%
Lago	139 967	306	-	-	-	306	306	27	2	0	2	0%	100%	9%
Lago Niassa	675	1	-	-	-	1	1	0	2	0	2	0%	100%	10%
Lalaua	105 886	231	-	-	-	231	231	25	2	0	2	0%	100%	11%
Lichinga	440 723	4 207	1 723	-	1 723	2 483	4 207	301	10	4	10	41%	100%	7%
Lugela	187 733	410	-	-	-	410	410	44	2	0	2	0%	100%	11%
Mabalane	43 640	95	-	-	-	95	95	10	2	0	2	0%	100%	10%
Mabote	49 462	108	-	-	-	108	108	11	2	0	2	0%	100%	10%
Macanga	344 604	753	-	-	-	753	753	77	2	0	2	0%	100%	10%
Machanga	58 967	129	-	-	-	129	129	14	2	0	2	0%	100%	11%
Machaze	154 772	338	-	-	-	338	338	35	2	0	2	0%	100%	10%
Macomia	102 229	223	-	-	-	223	223	23	2	0	2	0%	100%	10%
Macossa	68 349	149	-	-	-	149	149	15	2	0	2	0%	100%	10%
Maganja da Costa	349 807	2 313	365	-	365	1 948	2 313	245	7	1	7	16%	100%	11%
Magoe	153 989	337	-	-	-	337	337	34	2	0	2	0%	100%	10%
Magude	76 132	166	-	-	-	166	166	9	2	0	2	0%	100%	5%
Majune	48 305	106	-	-	-	106	106	6	2	0	2	0%	100%	5%
Malema	229 048	2 158	390	-	390	1 768	2 158	226	9	2	9	18%	100%	10%
Mandimba	63 888	140	-	-	-	140	140	8	2	0	2	0%	100%	5%
Mandlakazi	182 835	400	-	-	-	400	400	23	2	0	2	0%	100%	6%
Manhica	204 285	1 477	243	-	243	1 234	1 477	77	7	1	7	16%	100%	5%
Manica	340 322	744	-	-	-	744	744	79	2	0	2	0%	100%	11%
Maputo	2 365 408	48 709	27 553	859	26 693	21 156	47 849	3 556	21	12	20	57%	98%	7%
Maravia	153 756	336	-	-	-	336	336	35	2	0	2	0%	100%	10%
Maringue	110 556	242	-	-	-	242	242	25	2	0	2	0%	100%	10%

WASTE MANAGEMENT BY DISTRICT (3/4)

District	Population 2020	Generated t	Collected t	Properly managed t	Improperly managed t	Uncollected t	Mismanaged t	Leaked t	Generated kg/cap	Collected kg/cap	Mismanaged kg/cap	Share of Collected	Share of Mismanaged	Leakage rate
Marracuene	234 191	512	-	-	-	512	512	30	2	0	2	0%	100%	6%
Marromeu	227 792	2 292	423	-	423	1 870	2 292	244	10	2	10	18%	100%	11%
Marrupa	75 618	990	194	-	194	796	990	60	13	3	13	20%	100%	6%
Massangena	19 973	44	-	-	-	44	44	4	2	0	2	0%	100%	10%
Massinga	187 651	410	-	-	-	410	410	41	2	0	2	0%	100%	10%
Massingir	39 772	87	-	-	-	87	87	9	2	0	2	0%	100%	10%
Matutuine	41 811	91	-	-	-	91	91	6	2	0	2	0%	100%	7%
Mavago	38 465	84	-	-	-	84	84	4	2	0	2	0%	100%	5%
Maua	68 641	150	-	-	-	150	150	14	2	0	2	0%	100%	9%
Mecanhelas	619 595	1 355	-	-	-	1 355	1 355	116	2	0	2	0%	100%	9%
Meconta	214 540	469	-	-	-	469	469	49	2	0	2	0%	100%	11%
Mecuburi	223 477	489	-	-	-	489	489	51	2	0	2	0%	100%	10%
Mecufi	38 226	84	-	-	-	84	84	9	2	0	2	0%	100%	11%
Mecula	17 433	38	-	-	-	38	38	2	2	0	2	0%	100%	5%
Meluco	26 380	58	-	-	-	58	58	6	2	0	2	0%	100%	10%
Memba	327 483	716	-	-	-	716	716	71	2	0	2	0%	100%	10%
Metarica	48 000	105	-	-	-	105	105	10	2	0	2	0%	100%	10%
Milange	865 929	1 893	-	-	-	1 893	1 893	196	2	0	2	0%	100%	10%
Moamba	92 082	201	-	-	-	201	201	10	2	0	2	0%	100%	5%
Moatize	557 138	1 218	-	-	-	1 218	1 218	128	2	0	2	0%	100%	10%
Mocimboa da Prai	115 584	1 289	631	-	631	658	1 289	97	11	5	11	49%	100%	8%
Mocuba	466 629	4 099	725	-	725	3 374	4 099	434	9	2	9	18%	100%	11%
Mogovolas	449 362	982	-	-	-	982	982	104	2	0	2	0%	100%	11%
Moma	430 317	941	-	-	-	941	941	98	2	0	2	0%	100%	10%
Monapo	454 801	3 108	498	-	498	2 610	3 108	323	7	1	7	16%	100%	10%
Mongincual	234 489	513	-	-	-	513	513	46	2	0	2	0%	100%	9%
Montepuez	272 737	596	-	-	-	596	596	61	2	0	2	0%	100%	10%
Mopeia	217 007	474	-	-	-	474	474	51	2	0	2	0%	100%	11%
Morrumbala	608 150	1 330	-	-	-	1 330	1 330	136	2	0	2	0%	100%	10%
Morrumbene	141 333	309	-	-	-	309	309	31	2	0	2	0%	100%	10%
Mossuril	208 352	953	117	-	117	836	953	75	5	1	5	12%	100%	8%
Mossurize	357 782	782	-	-	-	782	782	81	2	0	2	0%	100%	10%

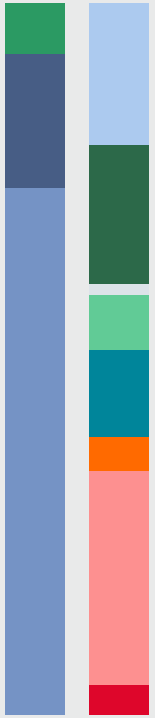
WASTE MANAGEMENT BY DISTRICT (4/4)

District	Population 2020	Generated t	Collected t	Properly managed t	Improperly managed t	Uncollected t	Mismanaged t	Leaked t	Generated kg/cap	Collected kg/cap	Mismanaged kg/cap	Share of Collected	Share of Mismanaged	Leakage rate
Muanza	53 277	116	-	-	-	116	116	12	2	0	2	0%	100%	11%
Muecate	146 250	320	-	-	-	320	320	34	2	0	2	0%	100%	11%
Mueda	154 472	338	-	-	-	338	338	30	2	0	2	0%	100%	9%
Muembe	50 378	110	-	-	-	110	110	6	2	0	2	0%	100%	5%
Muidumbe	86 122	188	-	-	-	188	188	20	2	0	2	0%	100%	11%
Murrupula	217 945	476	-	-	-	476	476	49	2	0	2	0%	100%	10%
Mutarara	439 284	960	-	-	-	960	960	101	2	0	2	0%	100%	11%
N'gauma	149 016	326	-	-	-	326	326	17	2	0	2	0%	100%	5%
Nacala Velha	372 639	4 096	3 436	-	3 436	660	4 096	395	11	9	11	84%	100%	10%
Namaacha	62 259	680	128	-	128	552	680	35	11	2	11	19%	100%	5%
Namacurra	229 838	502	-	-	-	502	502	55	2	0	2	0%	100%	11%
Namapa	356 059	778	-	-	-	778	778	81	2	0	2	0%	100%	10%
Namarroi	185 127	405	-	-	-	405	405	44	2	0	2	0%	100%	11%
Nampula	1 218 024	12 878	3 633	-	3 633	9 244	12 878	1 289	11	3	11	28%	100%	10%
Namuno	252 775	553	-	-	-	553	553	57	2	0	2	0%	100%	10%
Nangade	83 947	184	-	-	-	184	184	10	2	0	2	0%	100%	5%
Nhamatanda	363 381	794	-	-	-	794	794	86	2	0	2	0%	100%	11%
Nicoadala	548 734	4 356	1 278	-	1 278	3 078	4 356	476	8	2	8	29%	100%	11%
Nipepe	37 099	81	-	-	-	81	81	9	2	0	2	0%	100%	11%
Palma	56 357	123	-	-	-	123	123	6	2	0	2	0%	100%	5%
Panda	50 625	111	-	-	-	111	111	11	2	0	2	0%	100%	10%
Pebane	276 078	604	-	-	-	604	604	55	2	0	2	0%	100%	9%
Pemba	351 648	3 401	1 318	-	1 318	2 083	3 401	232	10	4	10	39%	100%	7%
Quissanga	37 349	82	-	-	-	82	82	9	2	0	2	0%	100%	11%
Ribaue	307 908	2 543	440	-	440	2 103	2 543	261	8	1	8	17%	100%	10%
Sanga	79 893	175	-	-	-	175	175	11	2	0	2	0%	100%	6%
Sussundenga	202 560	443	-	-	-	443	443	48	2	0	2	0%	100%	11%
Tambara	59 562	130	-	-	-	130	130	14	2	0	2	0%	100%	11%
Tsangano	286 873	627	-	-	-	627	627	65	2	0	2	0%	100%	10%
Vilanculos	155 581	340	-	-	-	340	340	34	2	0	2	0%	100%	10%
Xai-Xai	415 538	2 866	448	-	448	2 417	2 866	309	7	1	7	16%	100%	11%
Zavala	152 971	334	-	-	-	334	334	32	2	0	2	0%	100%	10%
Zumbu	118 180	258	-	-	-	258	258	26	2	0	2	0%	100%	10%

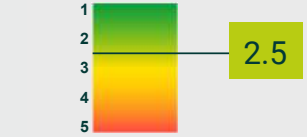
4.2 DATA QUALITY ASSESSMENT

POLYMER HOTSPOTS
DATA QUALITY ASSESSMENT (1/2)

Raw data		Modelling			Final metric	Score
Reliability		Temporal	Geographic	Granularity		
This study - Polymer | Polymer share of total recycling	2	2018 1	- 1	See additional notes on recycling sector and impor/export of plastic waste 3	Import of waste	3,0
*UN, 2020, Comtrade database** | Import of plastic waste	3					
This study - Polymer | Import of waste	3	2018 1	- 1	Recycling of imported = import of waste 2	Recycling of imported waste***	3,0
*UN, 2020, COMTRADE database** | Import products (sometimes polymer is known)	2	2018 1	When polymer is not specified: PlasticsEurope matrix used to assign polymer based on sector. 2	See Comtrade flowchart 2	Import of products	2,0
PlasticsEurope, 2018 |Polymers to Sectors correspondence matrix	1					
*UN, 2020, COMTRADE database** | Export of products (polymer can be unknown) and primary	2	2018 1	For products for which the polymer is not specified: PlasticsEurope matrix used to assign polymer based on sector. 2	See Comtrade flowchart 2	Export of primary and products	2,0
PlasticsEurope, 2018 |Polymers to Sectors correspondence matrix	1					
UN, 2020, COMTRADE database | Import of primary by polymer*	2	2018 1	- 1	1	Import and production of primary	1,5
ICIS, 2020 | Production quantity per polymer (no rubber)	1					
This Study - Sector | Change in Stock by sector	3	2018 1	Mapping from Sector to Polymer based on EU, but adapted through MOZ net input by polymer 2,5	- 1	Change in stock	2,5
This Study - Polymer | Net input	2,3					

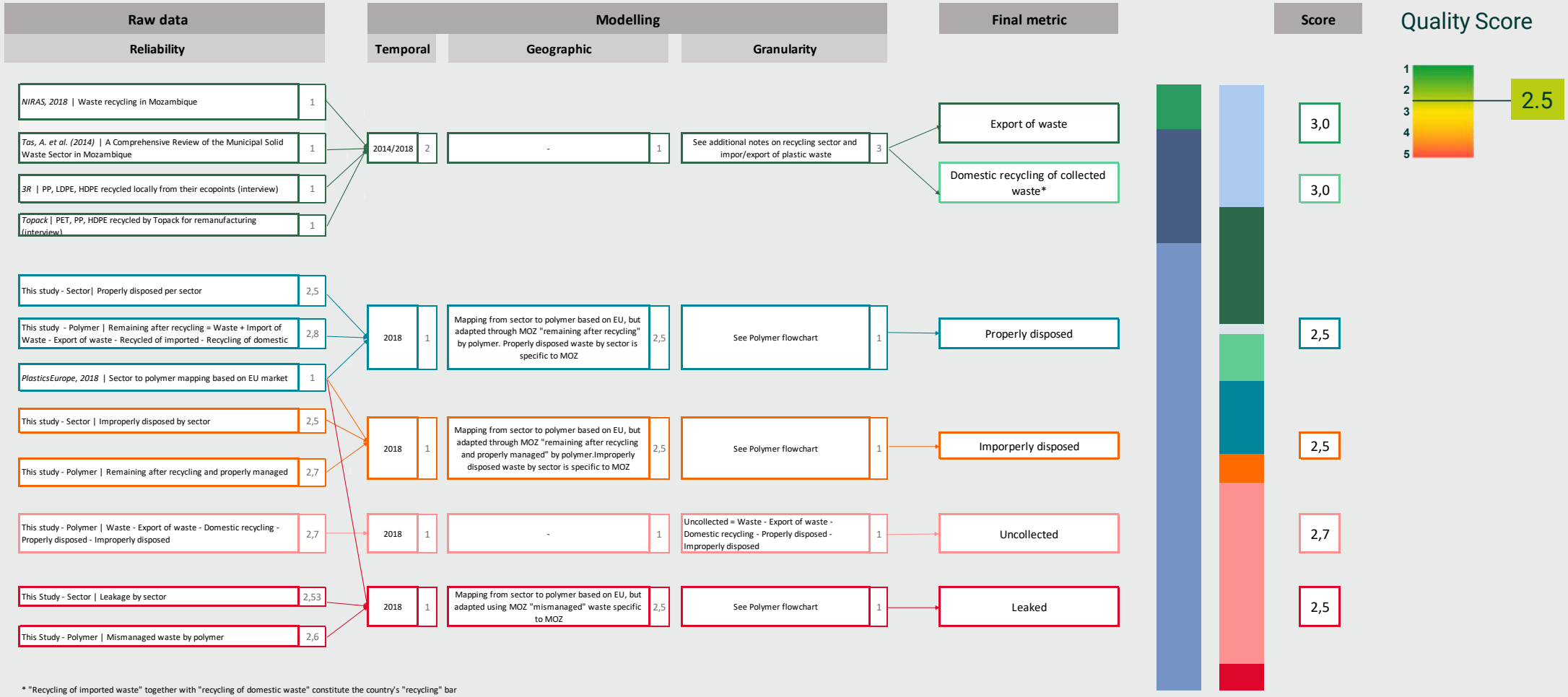


Quality Score



* For each trading code, we took the maximum value between what was reported to UN by Mozambique and what was reported by all partners trading with Mozambique. This allowsto ensure that we are not missing some plastic input in Mozambique.
** Net input = Import waste - Recycling of import + import of products - Export of primary and products + Import and production of primary
*** "Recycling of imported waste" together with "recycling of domestic waste" constitute the country's "recycling" bar

POLYMER HOTSPOTS
DATA QUALITY ASSESSMENT (2/2)



* "Recycling of imported waste" together with "recycling of domestic waste" constitute the country's "recycling" bar

Formal recycling and import of waste

Trade of recycled plastic and recycling in Mozambique were modelled based on 5 sources of information: Comtrade database, the Waste recycling in Mozambique report by NIRAS (*2018*), the comprehensive review of municipal solid waste in Mozambique by AMOR (*Tas et al., 2014*), interviews conducted in the framework of this study with 3R Mozambique and Topack. Data collected on recycling is summarised in the following table:

Polymer	Collected for recycling [kilo tonnes]	Share of recyclable for waste trade	Collected by 3R	Collected by Topack	Collected by Recicla	Collected Beira, NIRAS
PET	0,720	59%	0,12	0,6	0	0
HDPE	0,412	34%	0,096	0	0,25	0,066
PVC	0,000	0%	0	0	0	0
LDPE	0,084	7%	0,018	0	0	0,066
PP	0,006	0%	0,006	0	0	0
PS	0,000	0%	0	0	0	0
Other	0,000	0%	0	0	0	0
Polyester	0,000	0%	0	0	0	0
Synthetic Rubber	0,000	0%	0	0	0	0

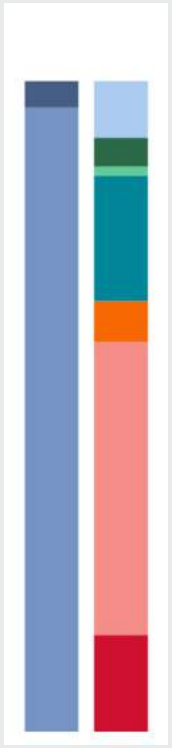
The total of plastic recycled in the country might not be well captured in our model as we built recycling figures from the ground up using multiple sources. We may have missed some recycling actors especially from the informal sector.

From the interview with 3R, we know that most of plastic waste brought to 3R ecopoints comes from waste pickers.

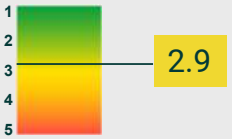
As shown in the table, we use the share of recyclable to determine which polymers are most probably traded as waste. We can then allocate waste trade to specific polymers.

APPLICATION HOTSPOTS
DATA QUALITY ASSESSMENT (1/2)

Raw data		Modelling			Final metric	Score
Reliability		Temporal	Geographic	Granularity		
*UN, 2020, COMTRADE database** | Import and export of products	2	2018 1	- 1	See Comtrade flowchart. Granularity is not as refined as necessary in order to inform action. 4	Import of products	4,0
					Export of products	4,0
This study – Sector | Waste from Packaging and Tourism sector	2,67	2018 1	- 1	For Packaging applications : Production = Waste + Export - Import. Waste = Waste from Packaging and Tourism * Share of import/export by application. For other application see additional notes 4	Production from primary	4,0
This study – Application | Share of import/export by application in Packaging sector	4					

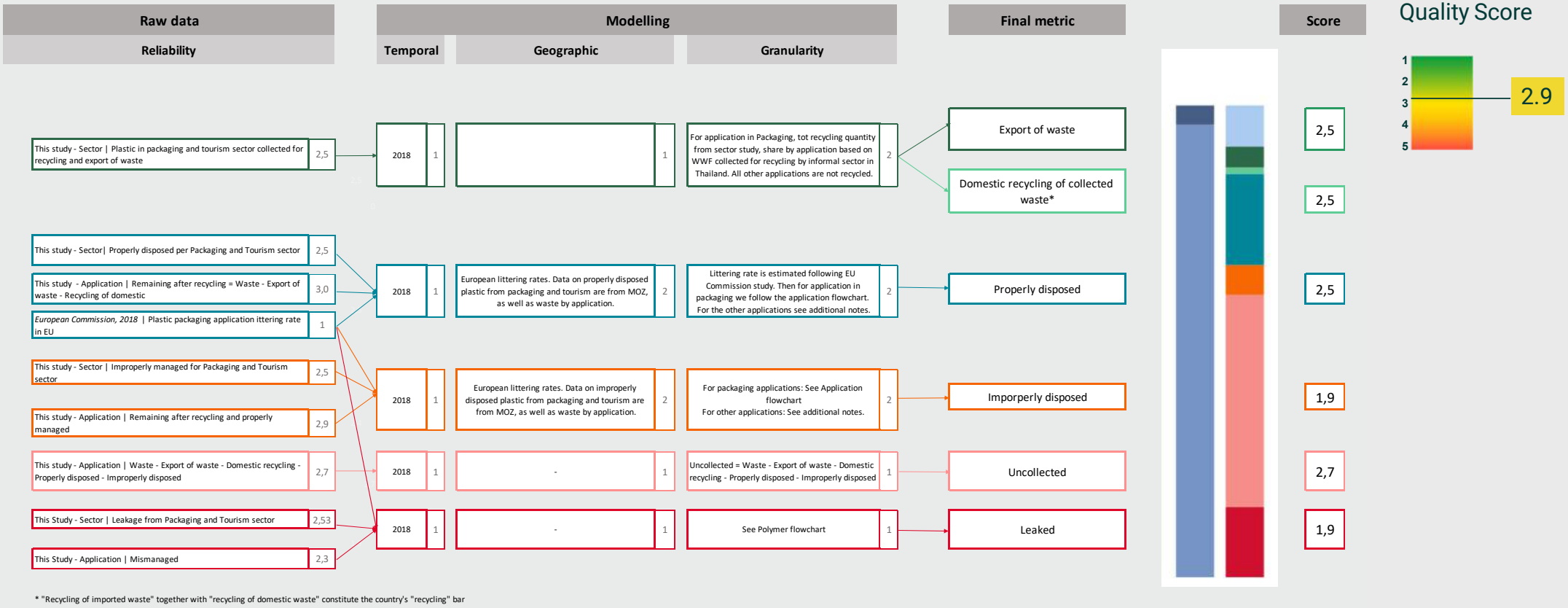


Quality Score



*For each trading code, we took the maximum value between what was reported to UN by Mozambique and what was reported by all partners trading with Mozambique. This allowsto ensure that we are not missing some plastic input in Mozambique.

APPLICATION HOTSPOTS
DATA QUALITY ASSESSMENT (2/2)



* "Recycling of imported waste" together with "recycling of domestic waste" constitute the country's "recycling" bar

APPLICATION HOTSPOTS MODELLING NOTES

Cigarettes filters

We estimate the number of cigarette filters from cigarette consumption data of the Tobacco Atlas project combined with population data of Mozambique. The plastic weight of a cigarette filter is 0.17 gr. From these data we obtain the waste generated. Trade data on import and export are determined through comtrade (code: 240220). Recycling is set to zero. The share of properly managed is taken from the average share of properly managed (sector hotspot), applied to the cigarette filters that are not littered. Littering rate is set to 29%, based on the EU littering report (European Commission, 2018). The improperly managed is based on the average share of improperly managed (sector hotspot), applied to cigarette filters not littered or properly managed. The release rate is adapted from PLP and applied to uncollected and improperly managed to determine the total leakage.

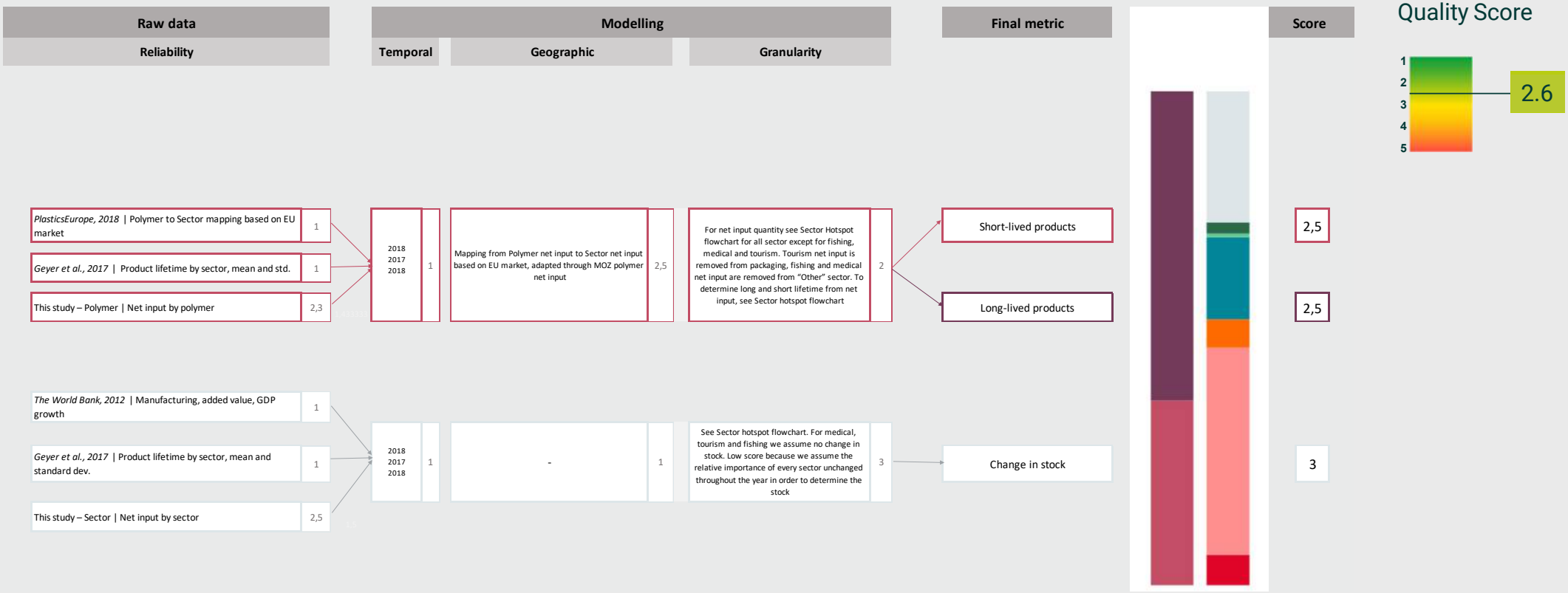
Sanitary towels

imports and exports are determined through Comtrade (code: 961900). Waste generation is estimated to be 3 sanitary towels/ day, 4 days/month, 12 month/year for all the female population from 15 to 55 years old, with one sanitary towel weighting approximately 2 gr. Recycling is set to zero. The share of properly managed is taken from the average share of properly managed (sector hotspot), applied to the sanitary towels that are not littered. Littering rate is set to 21%, based on the EU littering report (European Commission, 2018). The improperly managed is based on the average share of improperly managed (sector hotspot), applied to sanitary towels not littered or properly managed. The release rate is taken from PLP and applied to uncollected and improperly managed to determine de total leakage.

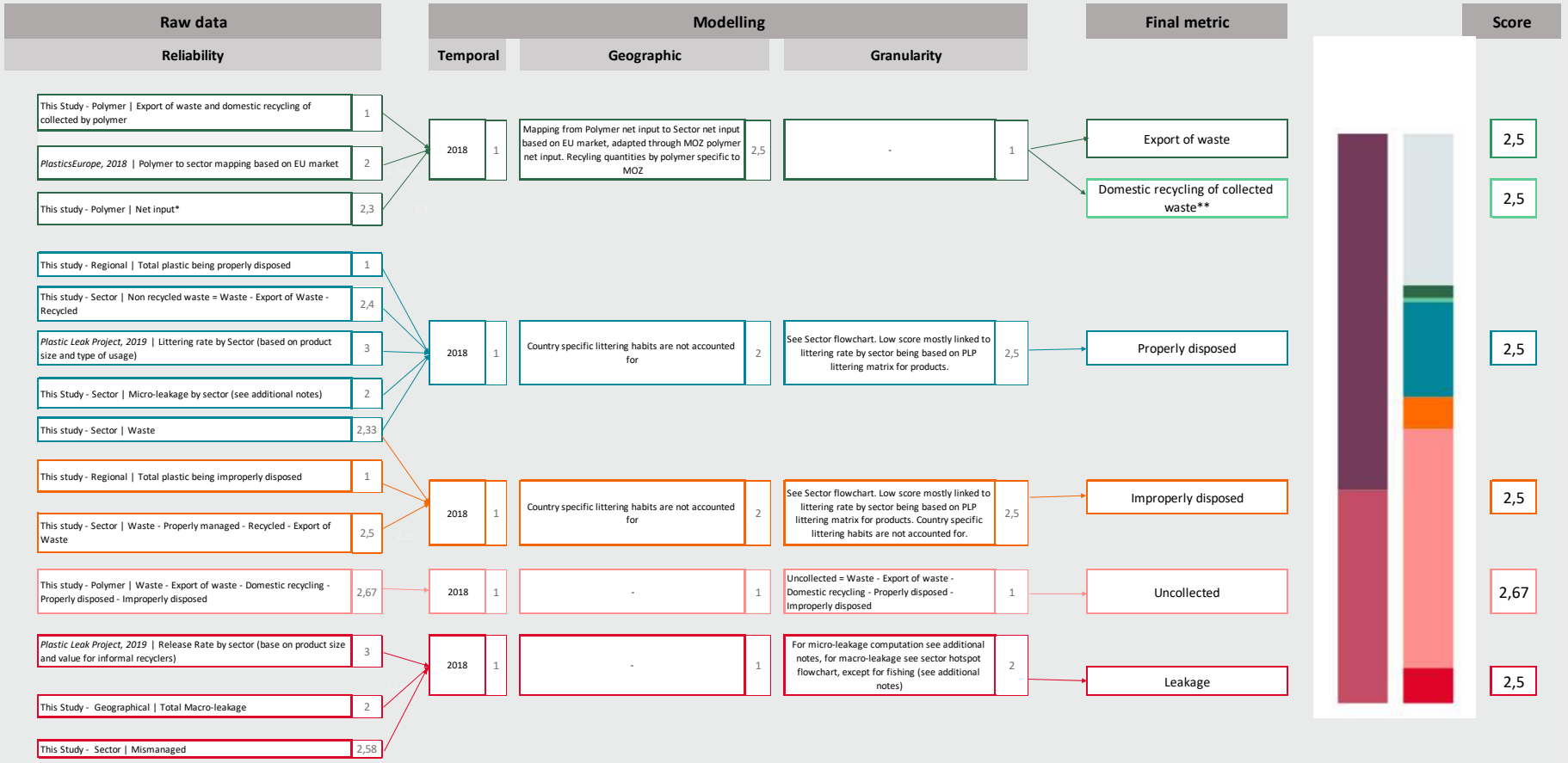
Baby diapers

imports and exports are determined through Comtrade. To determine the waste generation we consider that the urban population (36%) from 0-2 years old (half of the 0-4 pop in UN statistics database), uses 4.16 unit of diapers/day (Mendosa et al., 2018). Average weight of a baby diaper is 29,1 gr, from which 33% made of plastic components (Espinosa et al. 2015). Recycling is set to zero. The share of properly managed is taken from the average share of properly managed (sector hotspot), applied to the baby towels that are not littered. Littering rate is set to 21%, based on the EU littering report (European Commission, 2018). The improperly managed is based on the average share of improperly managed (sector hotspot), applied to baby diapers not littered or properly managed .The release rate is adapted from PLP and applied to uncollected and improperly managed to determine de total leakage.

SECTOR HOTSPOTS
DATA QUALITY ASSESSMENT (1/2)

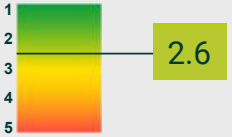


SECTOR HOTSPOTS
DATA QUALITY ASSESSMENT (2/2)



* Net input = Import waste - Recycling of import + import of products - Export of primary and products + Import and production of primary
** "Recycling of imported waste" together with "recycling of domestic waste" constitute the country's "recycling" bar

Quality Score



SECTOR HOTSPOTS MODELLING NOTES

Fishing

Data on number of fishing gears comes from "Censo Nacional da Pesca Artesanal 2012: Principais Resultados, Ministerio das Pescas". By default plastic weights by fishing gear type were derived from technical designs found in multiple publications including FAO. Combining these two pieces of information yields the net plastic input from fishing gears. (Quality Score = 3, as data is for 2012)

Medical

Total plastic waste generated by the medical sector is computed by combining the number of hospital beds 'B' (Instituto Nacional de Estatística - Estatísticas e Indicadores Sociais, 2013-2014, 8.4 beds per 10'000 inhabitants), the average bed occupancy rate, the total waste generated by bed (Udofia et al., 2013) and the average plastic share in medical waste. No distinction was made between infectious and non-infectious medical waste. (Quality Score = 3, as the average occupancy rate and the plastic share are by default value, and data source is from 2013)

Tourism

Data on number of tourists and average length of stay comes from the WTO Compendium of Tourism Statistics. We combine this information with the average plastic waste generation per capita per day derived from our calculations to estimate the plastic waste generated by the tourism sector. We make the assumption that a tourist will generate as much plastic waste as a Mozambican citizen. (Quality score = 3, as tourist could generate more plastic waste than the average citizen)

NB: We assume these three sectors to be short-lived and for all the plastic in these sector to go to waste within the year, no stock generated. This is accurate for Medical and Tourism and it aligns with the way we computed the net input from these two sectors. For fishing instead it could mean that we are over-estimating the waste generated. Note that the waste generated from fishing gears is already quite low.

Micro-leakage

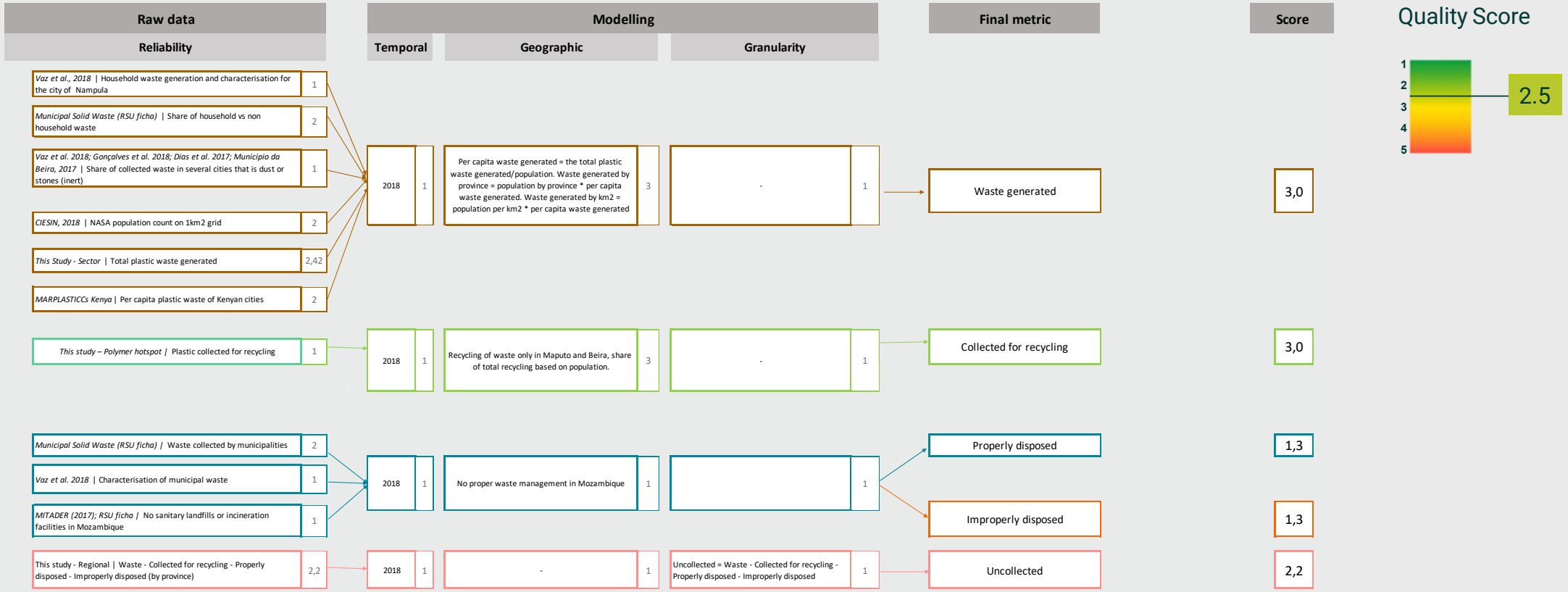
Automotive-tyres (tyre dust): loss and leakage of synthetic rubbers particles from tyres to the marine environment is calculated based on the methodology described in the Plastic Leak Project (2019). To estimate the number of vehicles by type, we use data from transports statistics in Mozambique (2010). Average mileage by vehicle type is assumed to be similar to Kenya and is taken from Notter el al. (2019).

Textile (Textile fibers): loss and leakage of textile fibers to the marine environment is calculated based on the methodology described in the Plastic Leak Project (2019)

Others (Cosmetics): loss and leakage of plastic micro-particles from cosmetics to the marine environment is calculated based on the methodology described in Plastic Leak Project (2019)

Others (Pellets): loss and leakage the marine environment of plastic pellets during transportation and production stages is calculated based on the methodology described in Plastic Leak Project (2020)

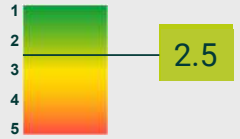
REGIONAL HOTSPOTS
DATA QUALITY ASSESSMENT (1/2)



REGIONAL HOTSPOTS
DATA QUALITY ASSESSMENT (2/2)

Raw data		Modelling				Final metric	Score
Reliability		Temporal		Geographic	Granularity		
This Study - Regional | Mismanaged = Uncollected + Improperly managed by province	2	2018	1	Based on rural / urban archetype with main cities having specific values 2	Share of mismanaged by province = Waste mismanaged by province / waste generated by province 1	Share of Mismanaged	2,4
This Study - Regional | Waste generated by province	3						
This study - Regional | Collected = Collected for recycling + Properly disposed + Improperly disposed	2,67	2018	1	Based on rural / urban archetype with main cities having specific values 2	Share of collected = Waste mismanaged by province / waste generated by province 1	Share of Collected	2,7
Richardson et al., 2019 | Loss rate by fishing gear type	2	1990 2012 2019	2,5	Number of fishing gear per province used to attribute fishing gear leakage. Number of fishermen used to attribute packaging thrown overboard 2	1	Leakage from fishing sector	2,5
Nédélec et al., 1990 | Drawings of various fishing gear	2						
MIMAIP, 2012 | Censo Nacional da Pesca	1						
This study – Sector | Leakage from the fishing sector	2						
This study - Regional | MWI by province	2,4	2020 2019 2017 2015	2	For each km^2 pixel: assign it to a watershed (based on its location) to know the runoff [R], compute the distance to shore or river (>10cms)[D], compute RR matrix*. Leakage of pixel = population of pixel x MWI of province x RR 2	- 1	Macro-leakage from land	2,0
NASA - SEDAC population count | GIS Population on 1kmx1km grid	1,5						
WWF HydroRivers | Country rivers	2						
WWF HydroSHEDS | Country watersheds	1						
Lebreton et al., 2017 | Catchment run-off of watersheds	2						
Boucher et al., 2019, IUCN | Release Rate matrix based on distance to waterbody and surface runoff	3						
Jambeck et al., 2015 | Central estimate for maximum release rate	2						

Quality Score



*1 With max release rate from Jambeck et al., 2015: 25%; D1 short < 2 km, D2 long > 100 km (Sistemiq), R1 small < 1st quartile of world runoff, R3 large > 3rd quartile of world runoff (Lebreton et al; 2017)

Waste generation

Waste generation for all towns is based on Voz et al. (2018) waste characterisation and generation study for the city of Nampula, adapted to include non-household waste and hidden plastic waste. This results in ~15kg of plastic waste generated per person per year, except for Maputo where the generation is 30 kg/pers/day (to match that of Kenyan cities). The per capita plastic waste generation in rural areas is such that the total plastic waste generation in Mozambique matches the one determined in the Sector hotspot analysis. For derailed calculation see MOZ_Waste tool.

Improperly managed

For towns where the Municipal Solid Waste form (RSU ficha) was available the improperly managed waste was computed as:Improperly managed = Waste collected * (Share of non hidden plastic + Share of hidden plastic)Waste collection quantities are estimated from the RSU ficha or from a study of the city when available (various sources). The share of non-hidden plastic comes from studies that perform a detail waste characterisation of the cities of . The share of hidden comes from textile, sanitary towels and diaper, e-waste, medical waste and multi-layer packaging (~23% of total plastic waste). For towns where a RSU ficha was not available, we used the lowest collection rate of the other cities (20%), applied to the waste generated. Studies were available for Pemba, Lichinga, Nacala, Nampula and Quelimane. Another waste characterisation study was available for the city of Beira. “RSU ficha” are available for the municipality of Beira Lichinga Chimoio Boane Mocimboa da Praia, Nacala Porto, Nampula, Inhambane, Pemba, Quelimane, Tete. For Maputo, we used information collected during the field trip, together with the share of plastic in the waste stream reported in studies. Detailed calculation process can be found in MOZ_Waste tool.

Leakage from fishing

Fishing: Plastic leakage from fisheries can be divided into three component: 1) Leakage due to gears lost at sea during fishing operations; 2) Leakage from gears discarded and mismanaged on land; 3) Leakage from plastic waste littered overboard by some fishermen. (1) Leakage due to gears lost at sea is computed using loss rates by fishing gear type provided by Richardson et al. (2019). For some fishing gears, loss is considered for fragments of the gear only, thus we had to make an assumption on how big a fragment would be (10%, 50% or 90% of a gear unit). Our default calculation takes the assumption of a fragment representing 50% of a gear unit. (2) Leakage from gear waste mismanaged on land is computed from the difference between net input and loss at sea, to which specific loss and release rates are applied. (3) Overboard littering is estimated by taking the average daily littering rate for packaging products in the country and applying it to the number of days each fisherman is out at sea, multiply it by two (assumption: 120 days per year at sea for full time fishermen). The number of fishermen comes from “Censo Nacional da Pesca Artesanal 2012: Principais Resultados, Ministerio das Pescas” (Quality score 2.5)

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