NATIONAL GUIDANCE FOR PLASTIC POLLUTION HOTSPOTTING AND SHAPING ACTION

FINAL REPORT FOR CYPRUS

December 2020

Implemented with ea + Quantis

Funded by the Didier et Martine Primat Foundation

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Report published in December 2020, with results for year 2018

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To be cited as:

IUCN-EA-QUANTIS, 2020, National Guidance for plastic pollution hotspotting and shaping action, Country report Cyprus

ABOUT

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The **IUCN Centre for Mediterranean Cooperation** (IUCN-Med) opened in Malaga (Spain) in October 2001 with the core support of the Spanish Ministry of Environment and the regional Government of Junta de Andalucía. The Centre's mission is to influence, encourage and assist Mediterranean societies to conserve and use sustainably the natural resources of the region and work with IUCN members and cooperate with all other agencies that share the objectives of IUCN.
www.iucn.org/regions/mediterranean

EA is a research consultancy based in Switzerland, member of the European Network of Ecodesign Centres (ENEC). EA has developed a unique expertise in the field of marine plastic pollution and plastic footprinting. - www.e-a.earth

Quantis is a leading sustainability consulting firm specialized in supporting companies to measure, understand and manage the environmental impacts of their products, services and operations - www.quantis-intl.com

ACKNOWLEDGEMENT

It is with deep gratitude that the IUCN Plastic Waste Free Islands Med (PWFI Med) project leaders wish to thank the various partners from government, private sector and industry, academia and research, civil society and non-governmental organizations that contributed to this work through their participation in workshops, meetings, field excursions, and related consultations within the country.

This work could not have been accomplished, first and foremost, without the partners and stakeholders who supported the data collection efforts within each country. Finally, the tremendous technical guidance, cooperation, and support from Feng Wang and Ran Xie of the UNEP was pivotal in the development of the hotspotting methodology guidance.

Above all, the PWFI Med team acknowledges the generous support of the Didier and Martine Primat Foundation.

IUCN wishes to thank the Cyprus Sustainable Tourism Initiative (CSTI) and the NGO Together Cyprus for their strategic guidance and support in ensuring that national activities and engagements were executed in a smooth manner. Special thanks to Philippos Drousiotis and Andreas Angeli for their support and providing data for this study.

The PWFI Med team would also like to thank the Ministry of Agriculture, Rural Development and Environment, the Department of Fisheries and Marine Research, the Department of Environment, the Deputy Ministry of Tourism, the Cyprus Hotel Association (CHA), the Green Dot Cyprus, the Association of Cyprus Travel Agents (ACTA), the Cyprus Hotel Managers Association (CYHMA), the Integrated Solid Waste Management (OEDA), and the Cyprus Port Authority, for their support to this work.

In addition, the PWFI Med team extends its gratitude to colleagues at IUCN Secretariat.

SUMMARY AT A GLANCE

Global view on plastic in Cyprus

93% Collection rate

7% Mismanaged rate

11% Collection for recycling

0% Domestic recycling rate

0.76 Kt Leakage

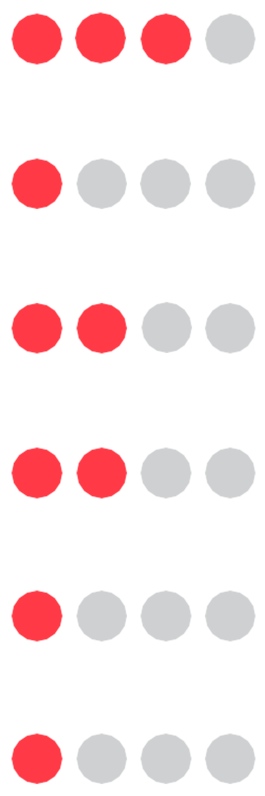
0.9 Kg Per capita leakage

Hotspots

Most critical polymers

- Synthetic rubber
- PET
- LDPE
- PP
- 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

2 out of 5 Provinces responsible for 60% of the plastic leakage

Shaping action from the hotspots

9 Actionable Hotspots

13 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

1

2 PLASTIC POLLUTION HOTSPOTS

3

4

5

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.

- A. Polymer Hotspots
- B. Application Hotspots
- C. Sector Hotspots
- D. Regional Hotspots
- E. Waste Management Hotspots

2.3 Actionable Hotspots

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

STRUCTURE AND OBJECTIVE OF THIS PRESENTATION

1
2
3
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.

Domestic waste: Waste generated within the country.

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.

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.

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

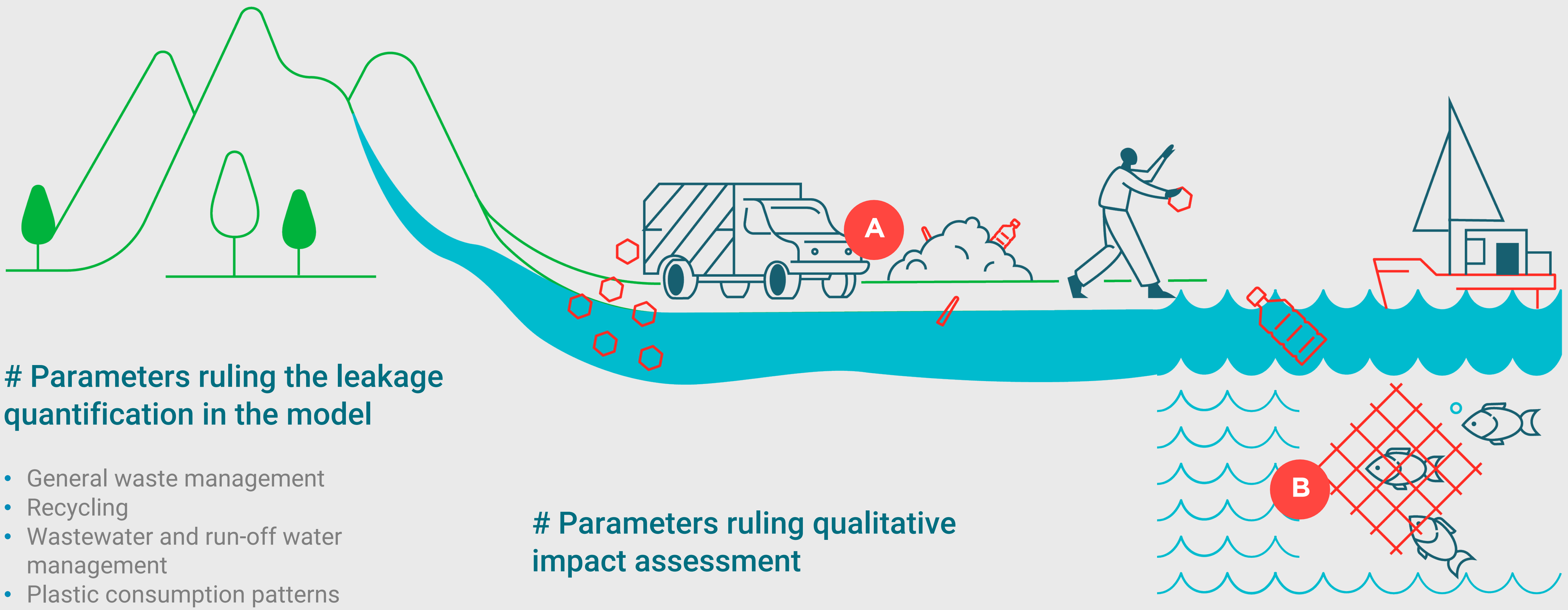
Informal sector: Individuals or a group of individuals who are involved in waste management activities, but are not formally registered or formally responsible for providing waste management services. Newly established formalized organizations of such individuals; for example, cooperatives, social enterprises 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

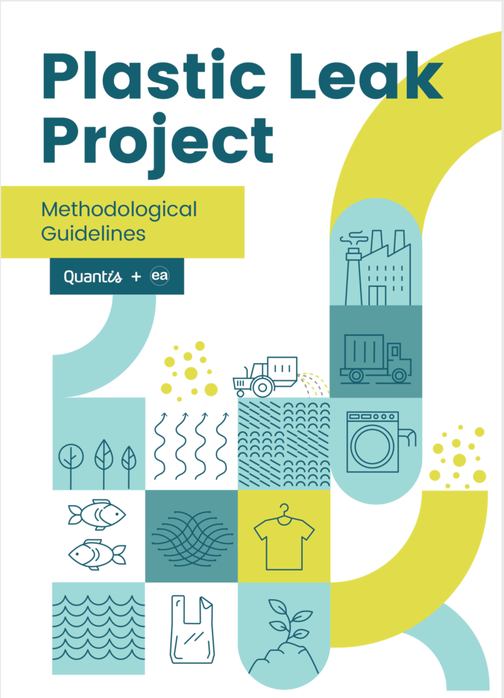


Parameters ruling the leakage quantification in the model

- 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

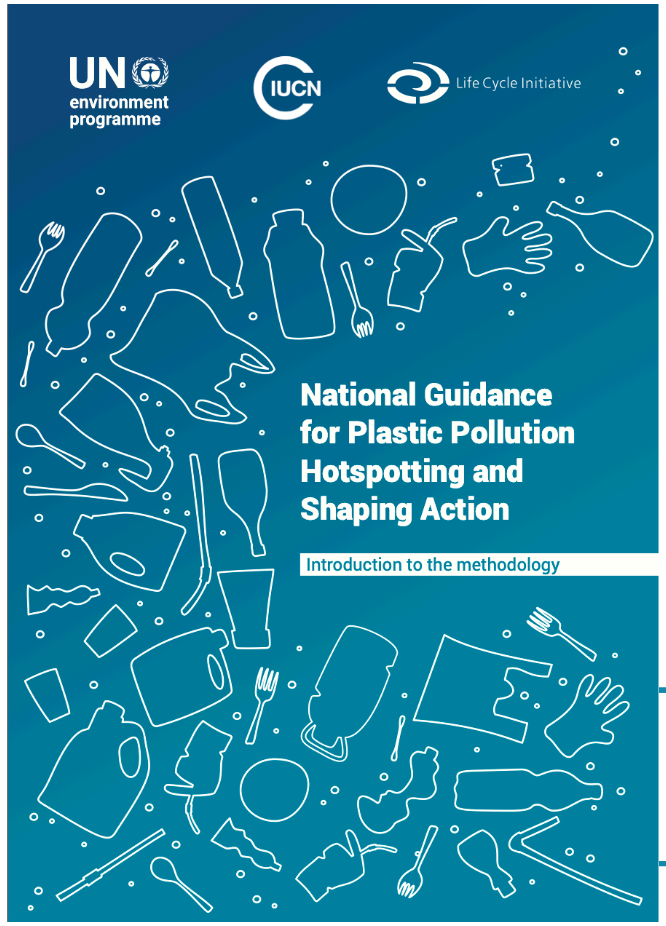
1 INTRODUCTION TO THE GUIDANCE

National guidance for plastic pollution hotspotting and shaping action

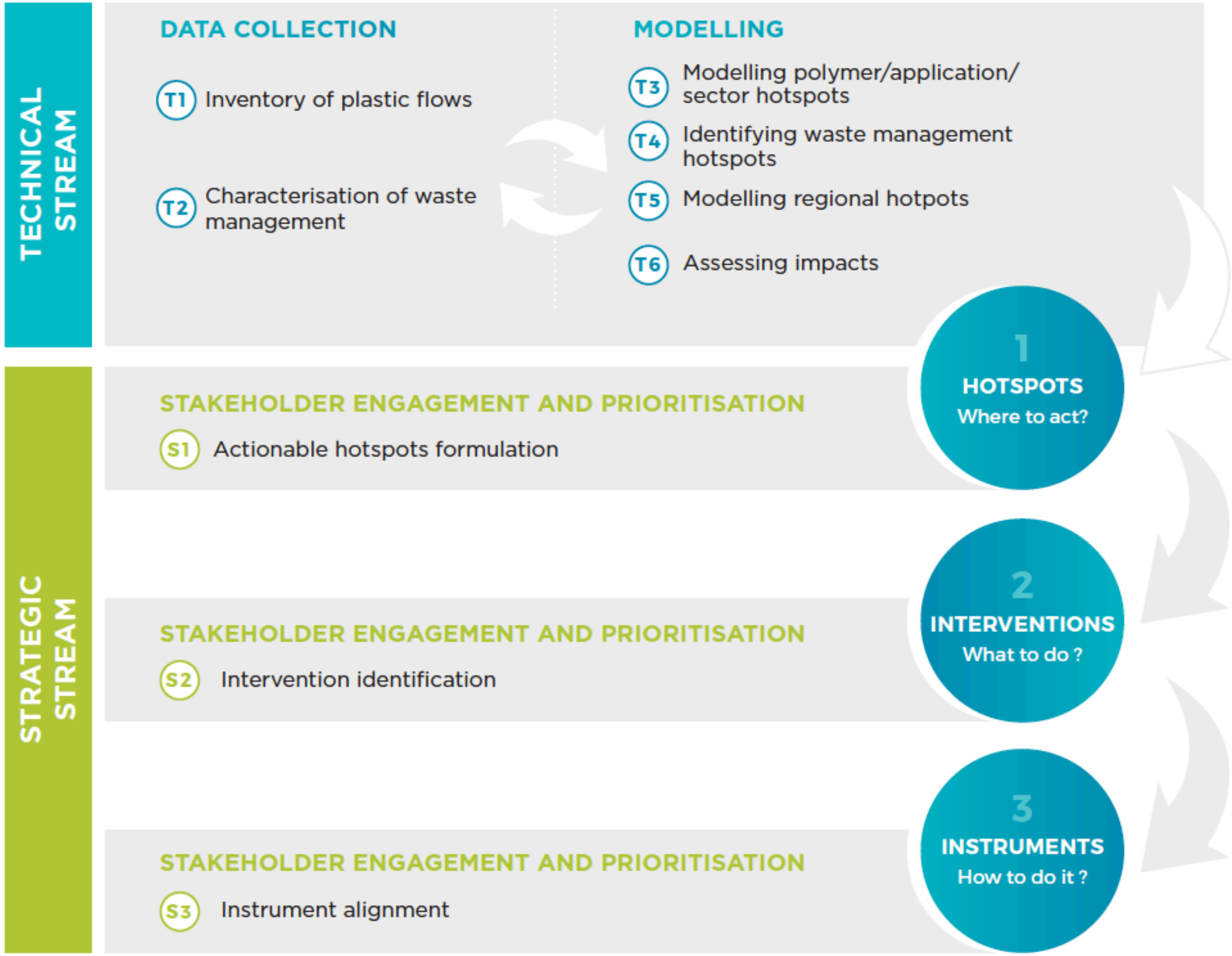
SCHEMATIC OF THE GUIDANCE

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 Hotspots

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.

Examples

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

2 Interventions

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

Examples

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

3 Instruments

A practical way to implement the intervention and enable progress.

Examples

- 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

MODULES		INPUT TOOLS	ASSESSMENT TOOLS			OUTPUT TOOLS
T1	INVENTORY OF PLASTIC FLOWS	Inventory of data sources and data gaps T1.1; Data collection templates T1.2; Fisheries model canvas T1.3	COMTRADE data extraction T1.4			Raw data repository A
T2	CHARACTERISATION OF WASTE MANAGEMENT	Inventory of data sources and data gaps T2.1; Data collection templates T2.2; Waste model canvas T2.3				
T3	MODELLING POLYMER/APPLICATION/ SECTOR HOTSPOTS	A	Fisheries leakage calculation T3.1	Polymer application/ sector MFA & leakage calculation T3.2	MFA modelling quality assessment T3.3; Polymer/application/sector hotspots prioritization canvas T3.4	Project data repository B
T4	IDENTIFICATION OF WASTE MANAGEMENT HOTSPOTS		Waste management hotspot canvas T4.1			
T5	MODELLING REGIONAL HOTPOTS	Waste data by archetype T5.1	GIS model T5.2	Leakage calculation T5.3	GIS modelling quality assessment T5.4	
T6	ASSESSING IMPACTS		Plastic application impact assessment T6.1			
S1	ACTIONABLE HOTSPOT FORMULATION	T3.4; B				Actionable hotspot formulation C
S2	INTERVENTION IDENTIFICATION	Interventions library template S2.1	Interventions selection S2.2	Interventions prioritisation S2.3		Final intervention and instrument pairing D
S3	INSTRUMENT ALIGNMENT	Instruments library template S3.1	Instruments selection S3.2	Instruments prioritisation S3.3		

DISCLAIMER

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

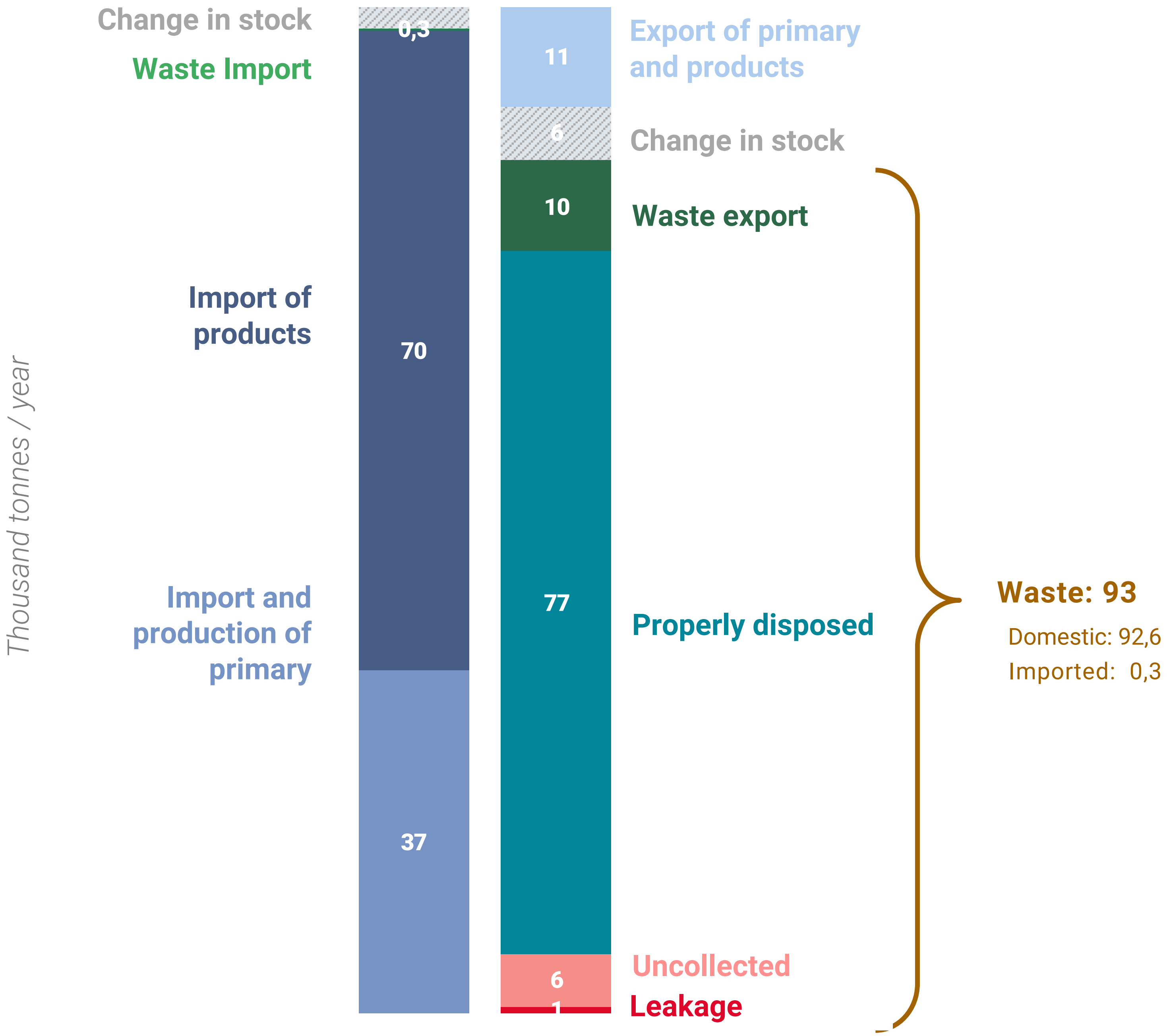
Additional information on the methodology and modelling process can be found directly in the **modules and tools** associated with the guidance and highlighted by this icon.

2 PLASTIC POLLUTION HOTSPOTS

2.1 COUNTRY OVERVIEW

COUNTRY PLASTIC MATERIAL FLOW [2018]

Summary of the results for all plastics in the country



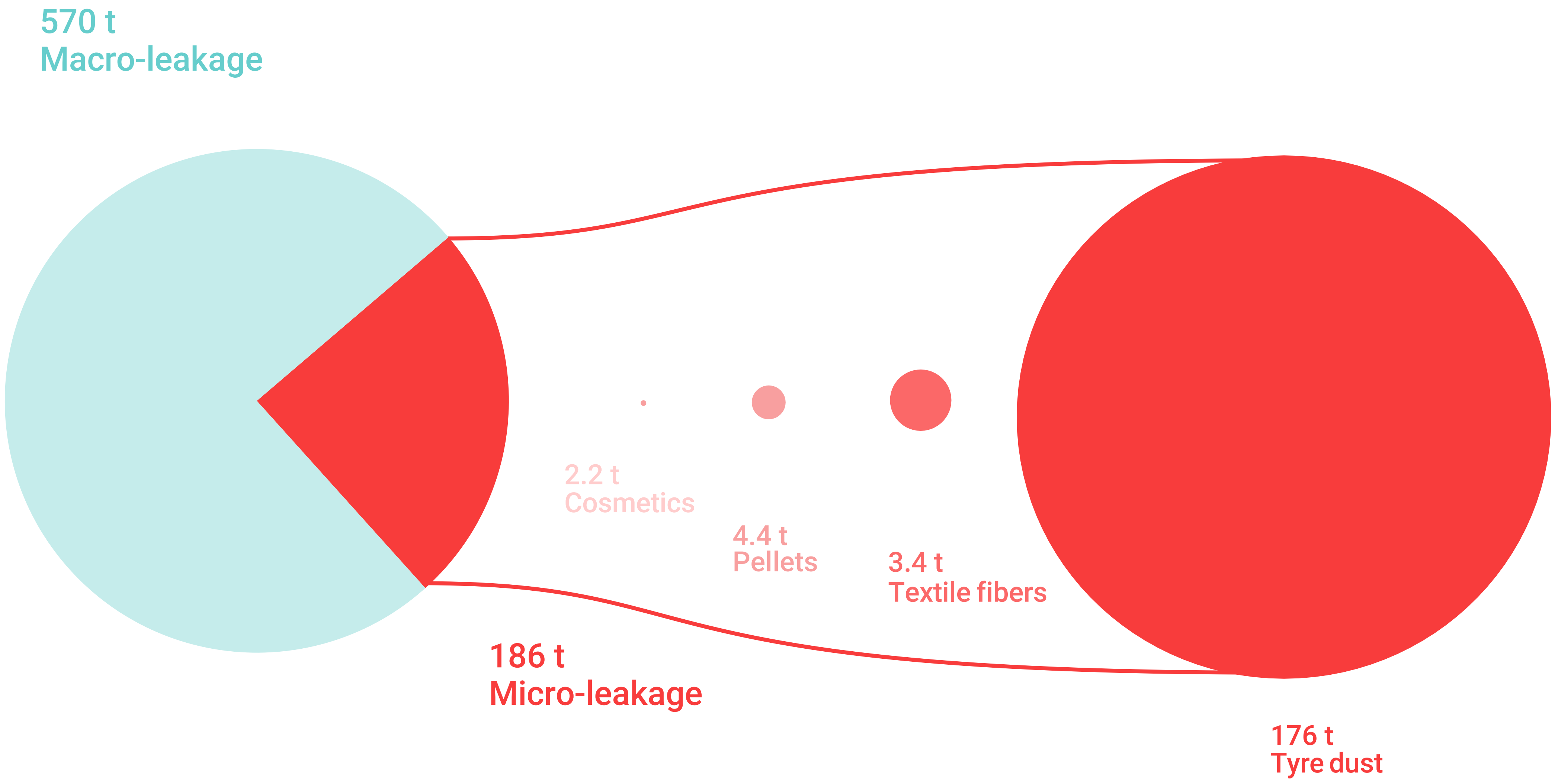
Note: For simplicity, in this figure, we removed a part of the "leakage" from the "uncollected", so that the "uncollected" value displayed corresponds to a post-leakage situation.

Key take-aways

- No primary plastic production in Cyprus.
- **92'588 t** of plastic waste generated, from which 10'495 t are attributed to tourism. Plastic waste generation per capita amounts to 94 kg/cap/year, well above the Western Europe average* (64 kg/cap/year).
- **93%** collection rate on average.
- No recycling facilities in Cyprus. Around **11%** of plastic waste is exported for recycling.
- Only **7%** of waste generated in Cyprus is mismanaged (stemming from littering and uncollected waste).
- **756 tonnes of plastic leak into waterways in 2018,** including 86 tonnes from the tourism sector. This corresponds to 1% leakage rate and 0,8 kg/cap/year leakage per capita.

* 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 [2018]



TO WATERWAYS AND OCEANS:

756 t

Key take-aways

- **Micro-leakage contributes for 25 % of the overall country leakage.** This is mainly driven by tyre abrasion during road transportation.

Learnings

In 2018, Cyprus has one of the largest number of passenger cars per thousand inhabitants with more 600 cars per 1’000 capita. Moreover, the waste water treatment efficiency in Cyprus is relatively high (around 80% of collected waste water is properly treated). This explains the huge discrepancies in micro-leakage contribution between tyre dust and other causes.

More details available in Appendices

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

OPEN BURNING: A ROUGH ESTIMATE [2018]

6.4 kt

Total plastic mismanaged

Up to

60%

Could be released into the air as noxious chemical substances through open burning

POTENTIAL POLLUTION TO THE AIR:

3.9 kt

Key take-aways

- **Open burning** of mismanaged plastic waste can pose significant risks for human health (due to the release of noxious chemical substances such as dioxin and particulate matters) and directly contribute to climate change.

Limitations

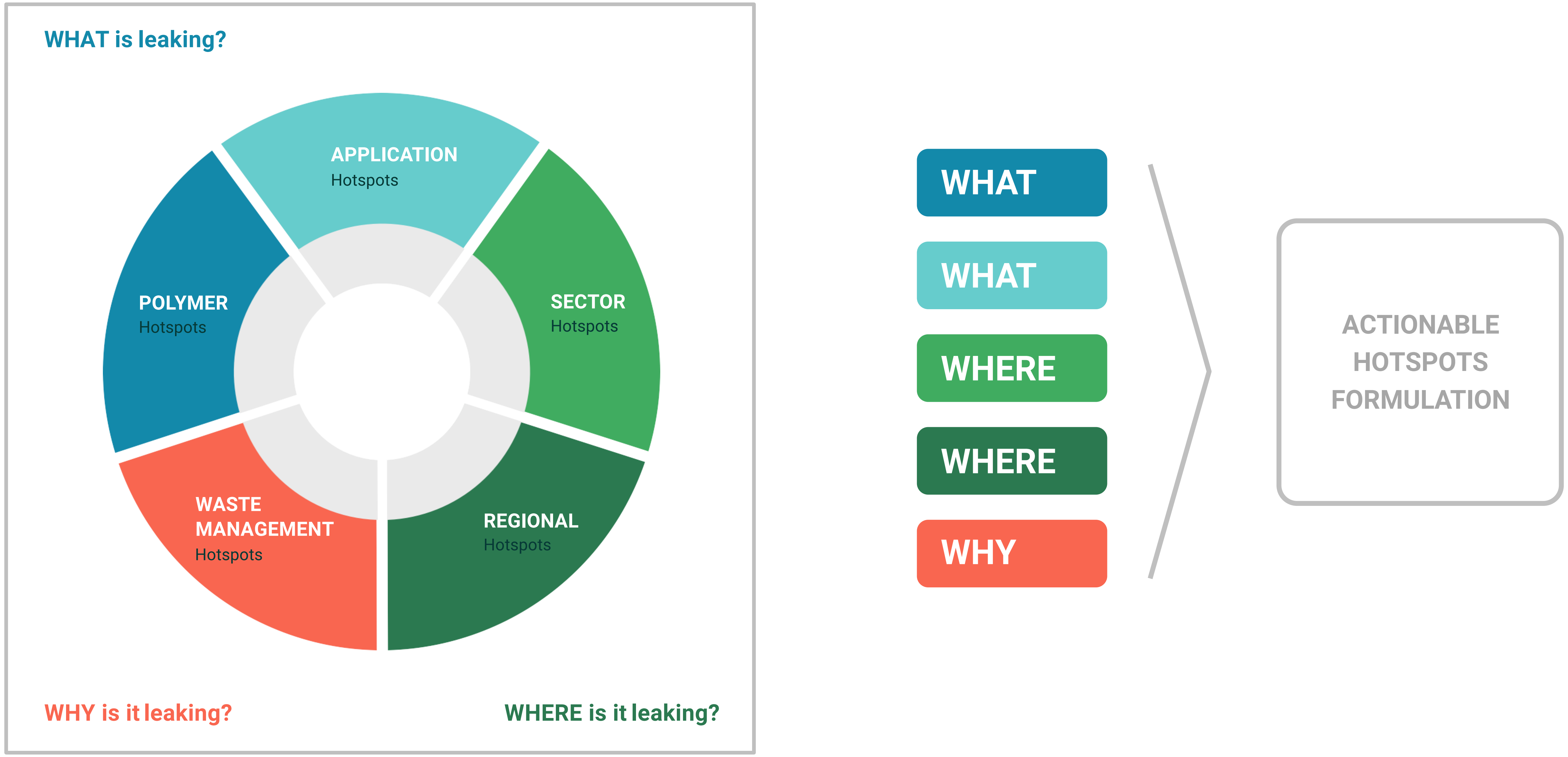
Although we do not have specific data on burning, we suggest a rough estimate of how much plastic could be polluting the air by using the assumptions made in the *Breaking the Plastic Wave* report (*Lau et al, 2020*): 60% of uncollected plastic waste and 13 % of plastic waste at dumpsites are burnt on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

Unlocking limitations

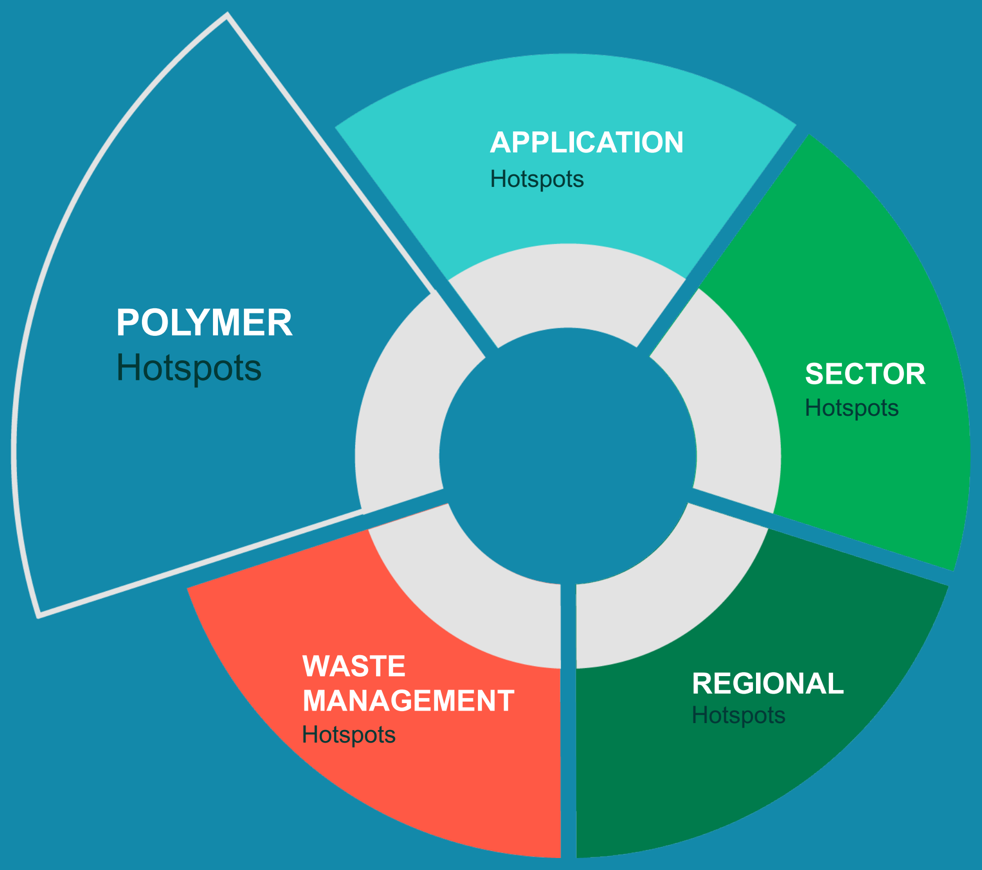
Investigate open burning practices and conduct field studies to estimate the amount of mismanaged plastic waste that is burned.

2.2 DETAILED HOTSPOTS RESULTS

5 CATEGORIES OF HOTSPOTS



A POLYMER HOTSPOTS

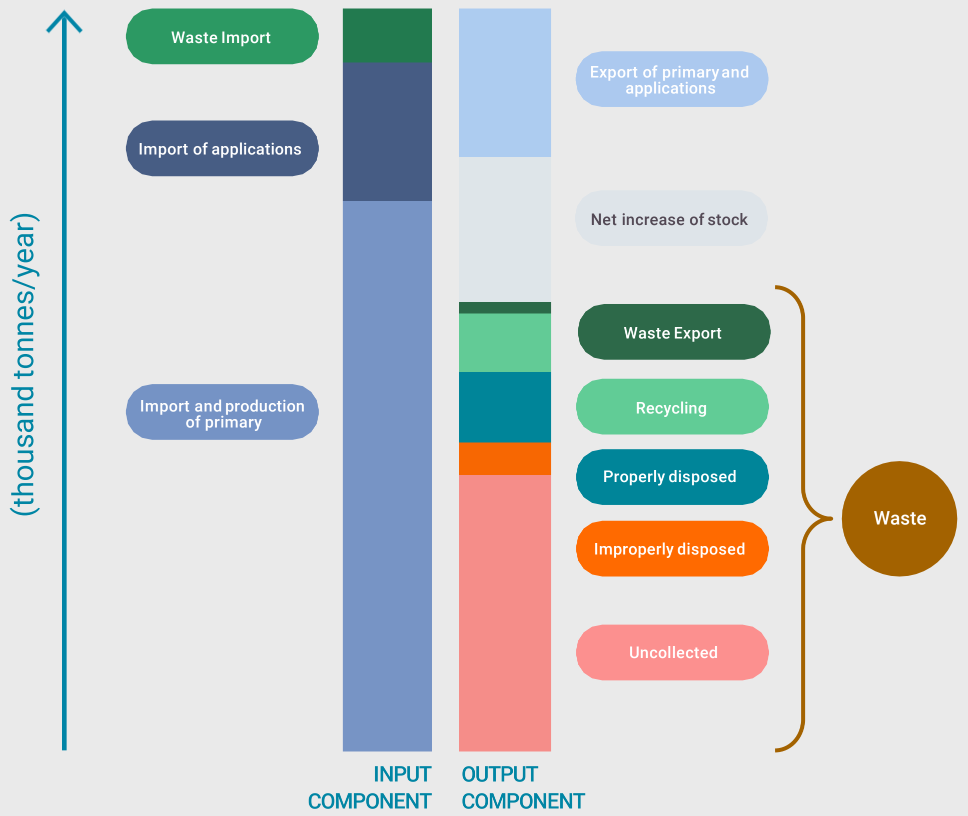


OBJECTIVE AND INSTRUCTIONS

Key question answered:

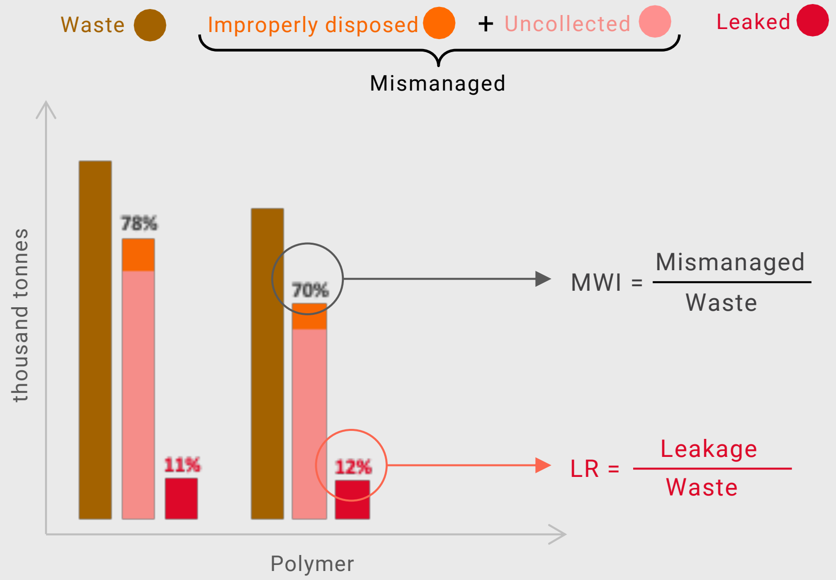
Which polymers are most critical in the country regarding plastic leakage?

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

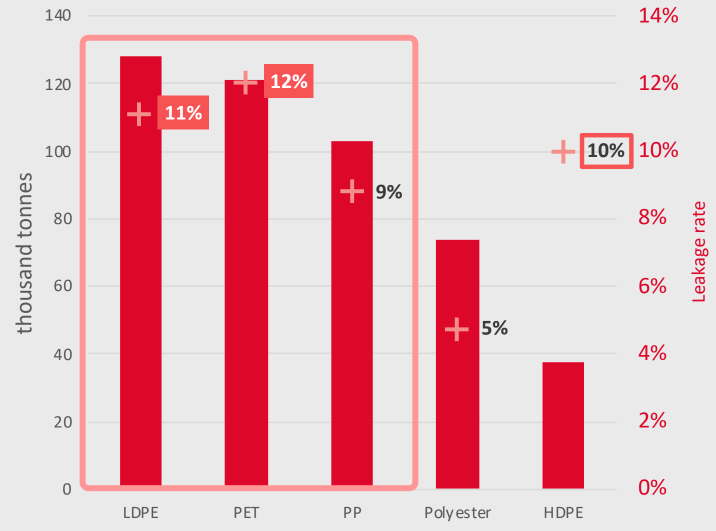


How to read the polymer hotspot graph?

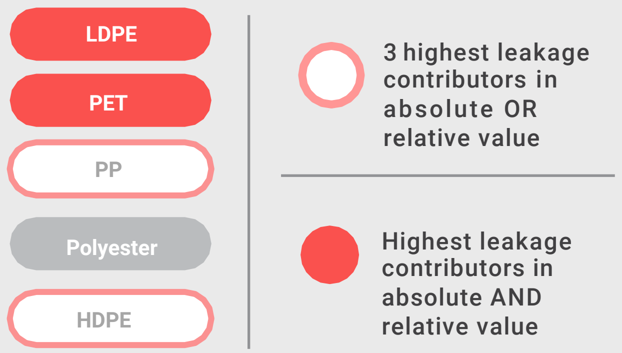
1. Determine leakage from mismanaged waste



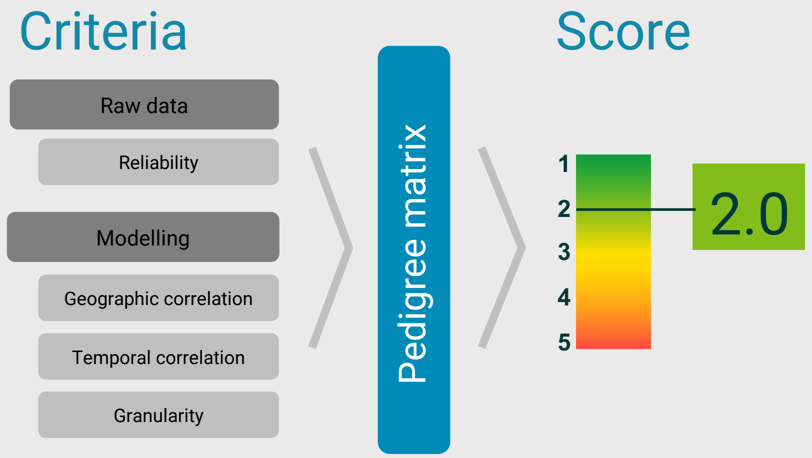
2. Focus on leakage and leakage rate



3. Select hotspots based on absolute and relative leakage



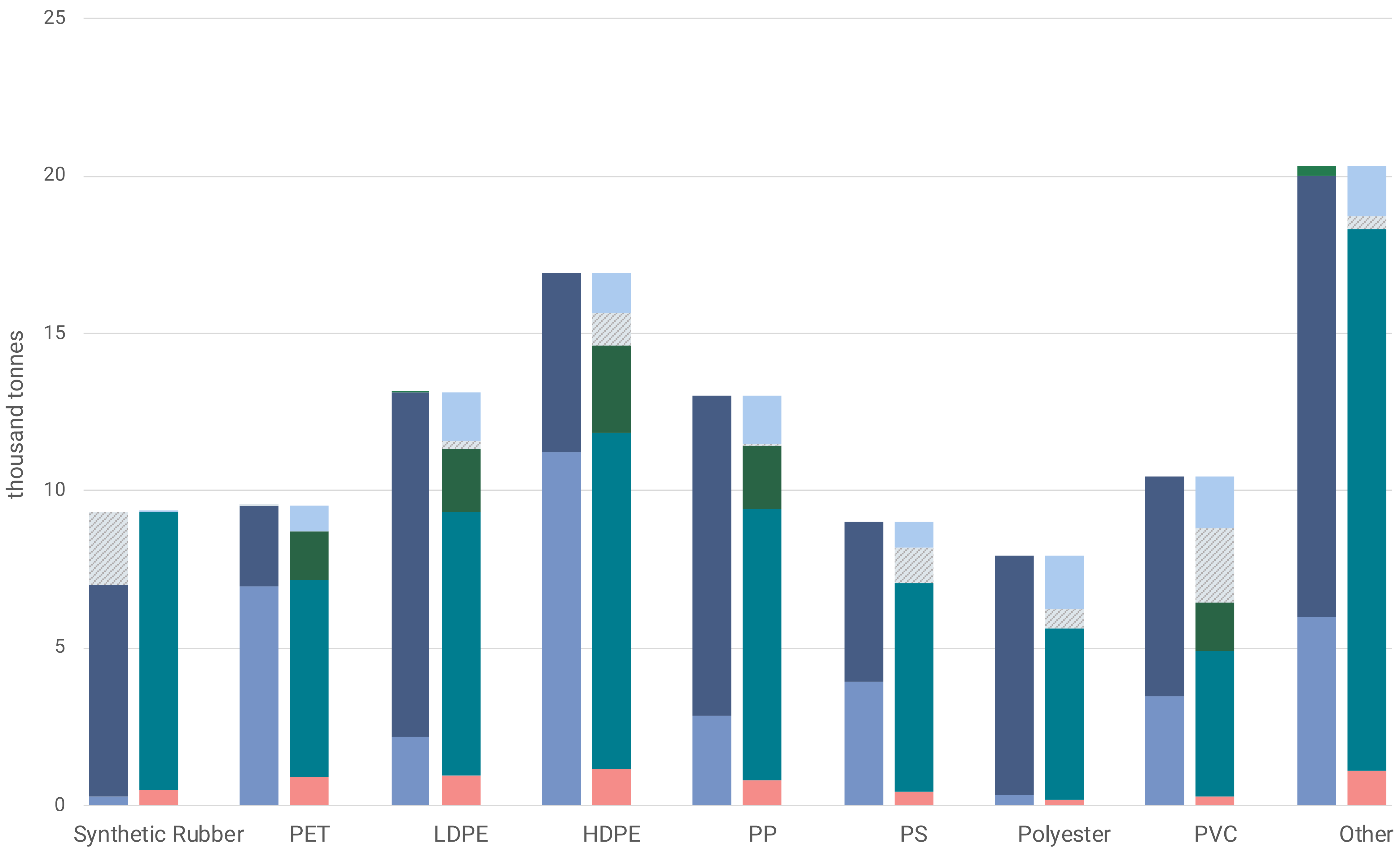
4. Assess the quality score of the results



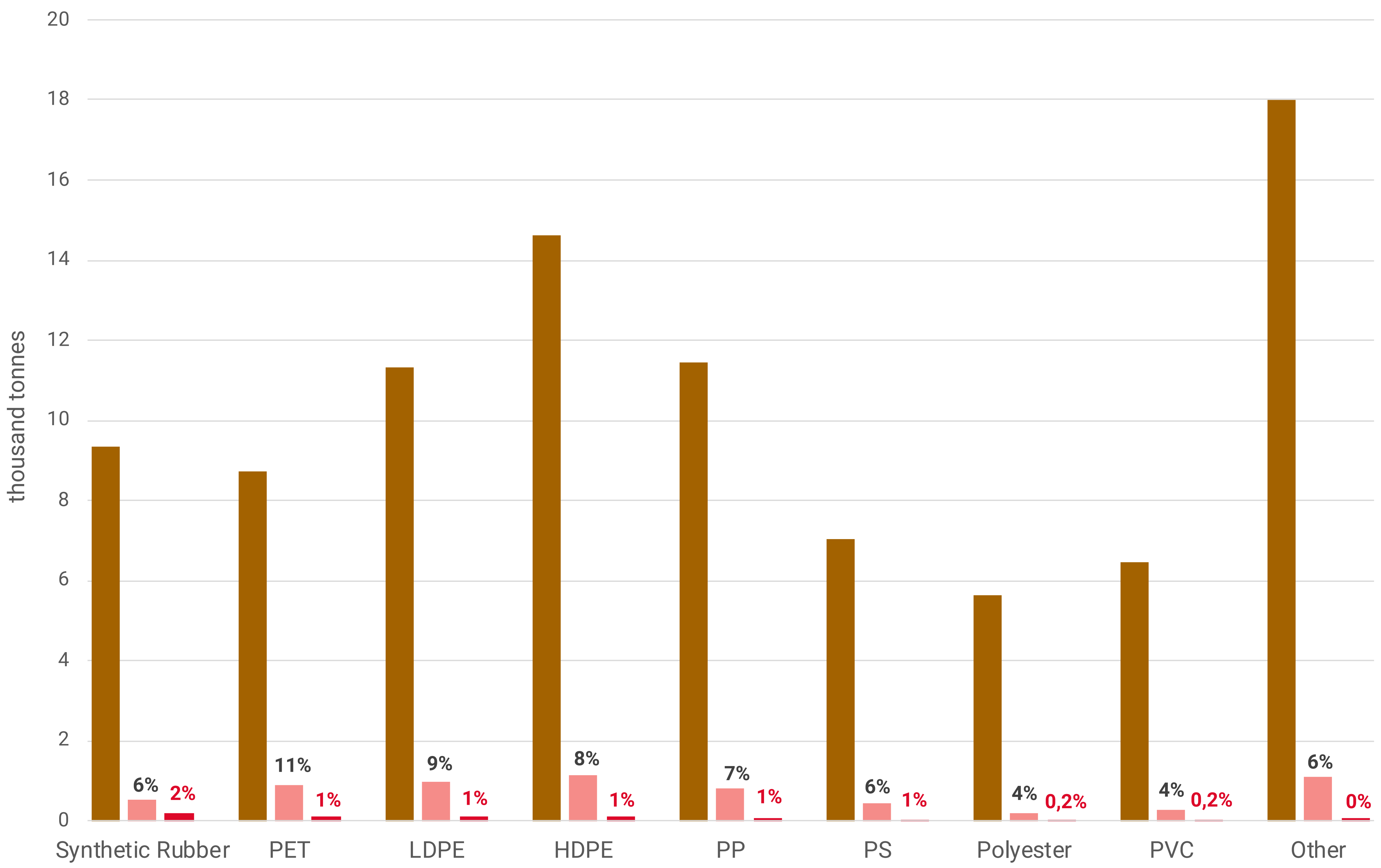
For more details, please read the Methodology

T3

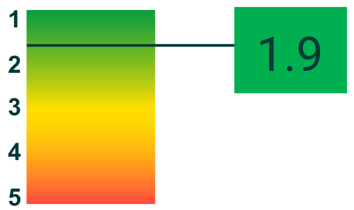
MASS BALANCE BY POLYMER [2018]



MISMANAGED WASTE AND LEAKAGE BY POLYMER [2018]



Quality Score



Domestic waste

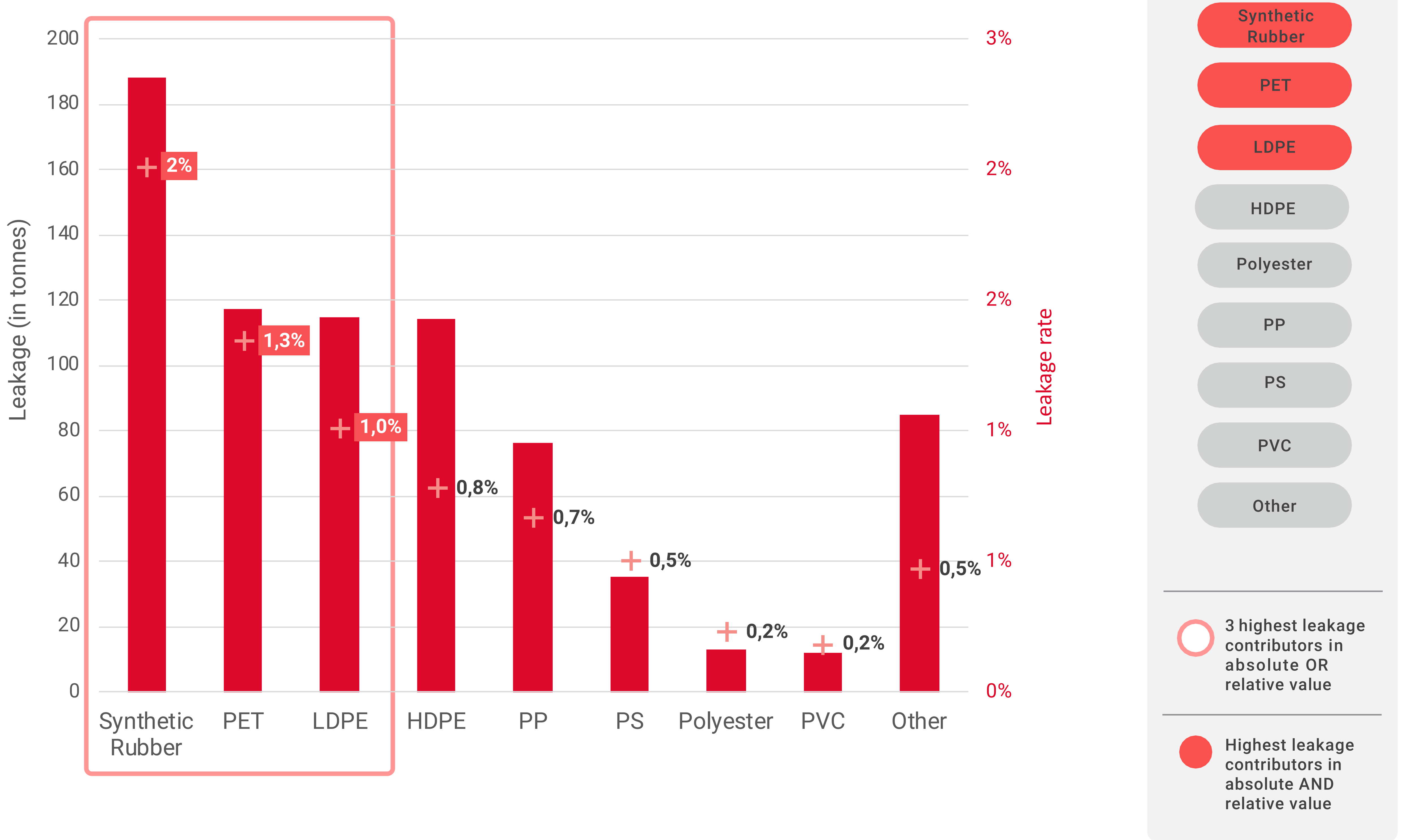
Improperly disposed + Uncollected } Mismanaged

Leaked

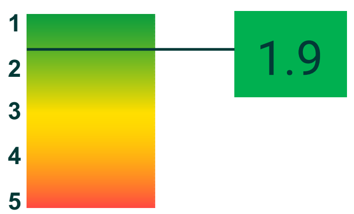
X% | Mismanaged Waste Index (MWI)

X% | Leakage Rate (LR)

POLYMER HOTSPOTS [2018]



Quality Score



Key take-aways:

- **Synthetic rubber** is the top contributor in absolute plastic leakage (188 t), with the highest leakage rate (2%)
- **PET** is in second position, with an absolute plastic leakage of 112 t and a leakage rate of 1.3%.
- **LDPE** and **HDPE** follow closely with respectively 115 t and 114 t of plastic leakage.

POLYMER HOTSPOTS:
INTERPRETATION AND LIMITATIONS

Synthetic Rubber

Learnings

Synthetic rubber, which is mostly used in automotive tyres, has the highest contribution to plastic leakage in waterways and oceans. This leakage almost entirely stems from tyre abrasion which releases micro-particles into the environment, which is substantial in Cyprus. Indeed, the leakage from automotive tyres in Cyprus tantamount to 50% that of the packaging sector (*see sector hotspots*) when for some other piloted countries this figure remains below 5%. Consequently, Synthetic rubber eventually leaks more than other polymers which are used in multiple sectors.

PET

Learnings

Even though the total quantity of PET plastic waste generated in the country is lower than that of HDPE and LDPE, its contribution to leakage is larger, thus placing it right after the most leaking polymer which is Synthetic Rubber. This is for two reasons: First, PET has the lowest collection rate among all polymers, hence a higher mismanagement rate than for other polymers. And secondly, PET has the highest release rate once mismanaged which means that in Cyprus, PET is more likely to end up in waterways than HDPE or LDPE.

LDPE & HDPE

Learnings

Although LDPE and HDPE are the polymers with the highest waste generation, they are more recycled and less mismanaged than PET. Consequently they have a slightly lower absolute leakage than PET.

All polymers

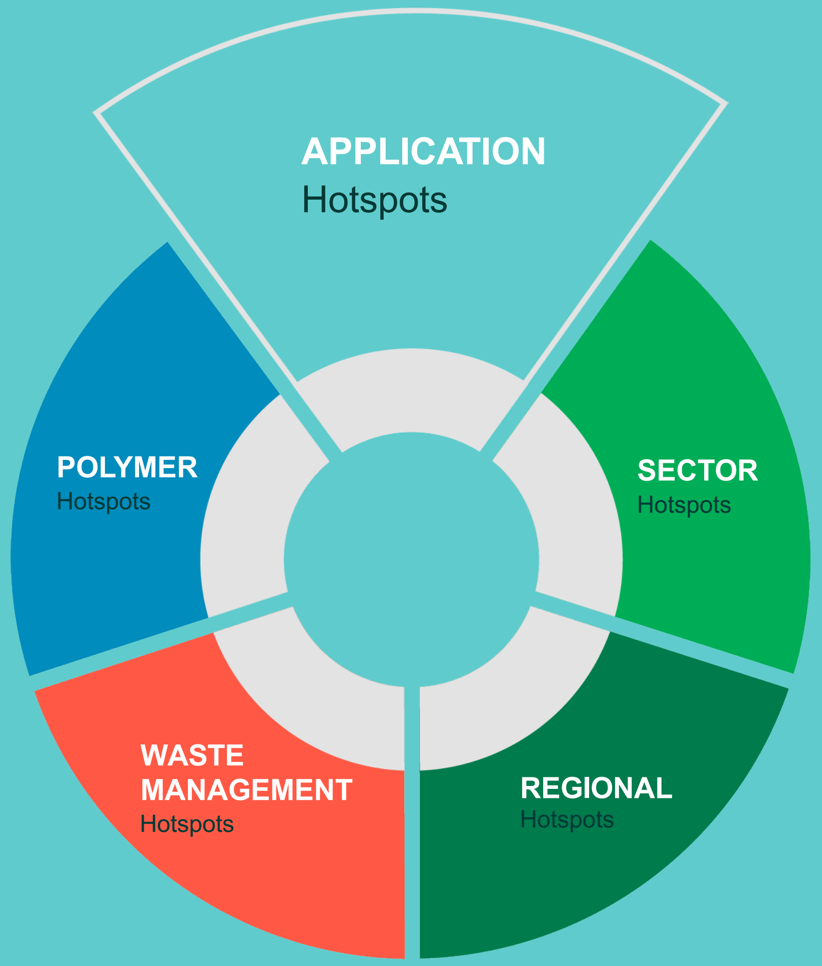
Limitations

Since only the total quantity of plastic recycled is known (9.85 k according to the *Statistical Services of Cyprus, 2019*), we allocated the amount of plastic recycled by polymer based on the share of polymer waste generated out of the total plastic waste, which obviously does not reflect the reality.

Unlocking limitations

Contact formal recyclers to have a better understanding of how much of each polymer is being recycled in Cyprus.

B APPLICATION HOTSPOTS

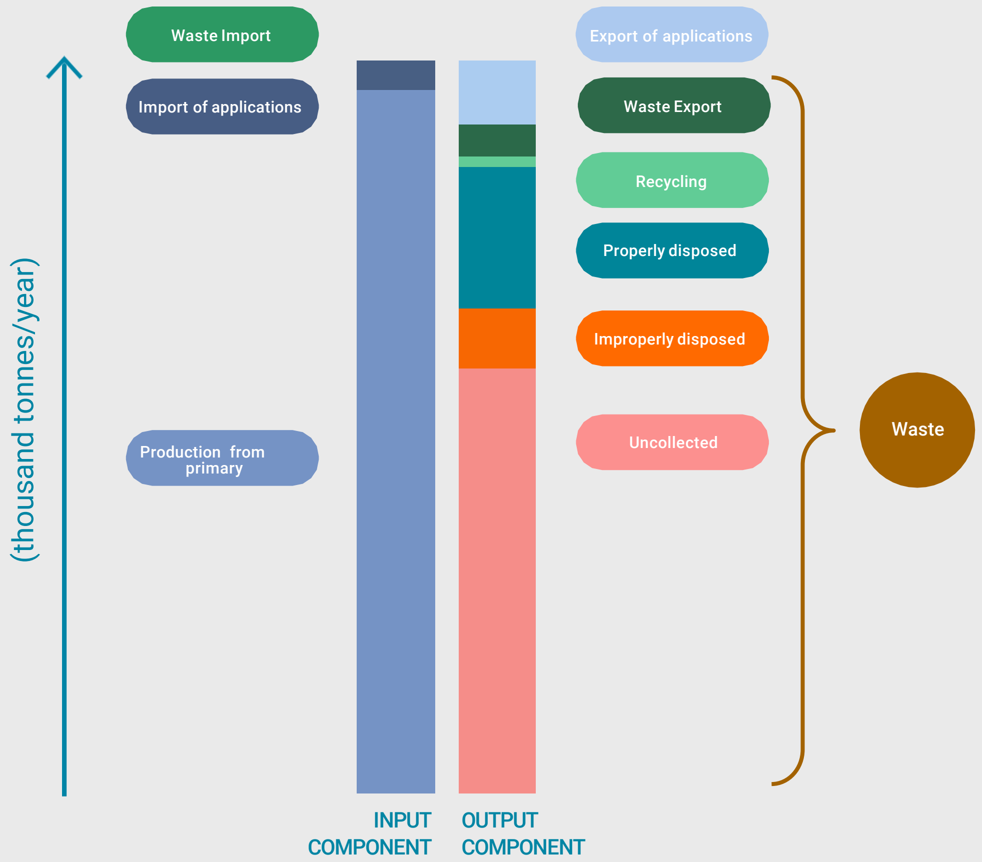


OBJECTIVE AND INSTRUCTIONS

Key question answered:

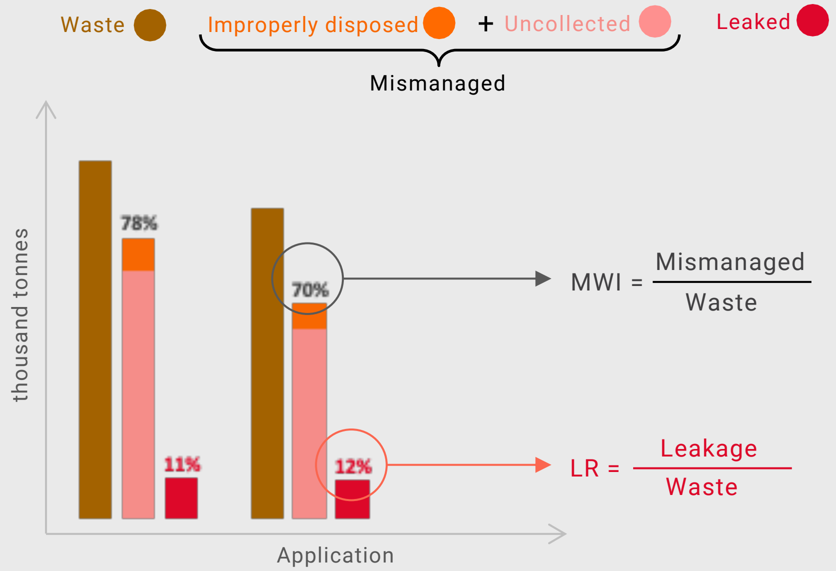
Which applications are most critical in the country regarding plastic leakage?

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

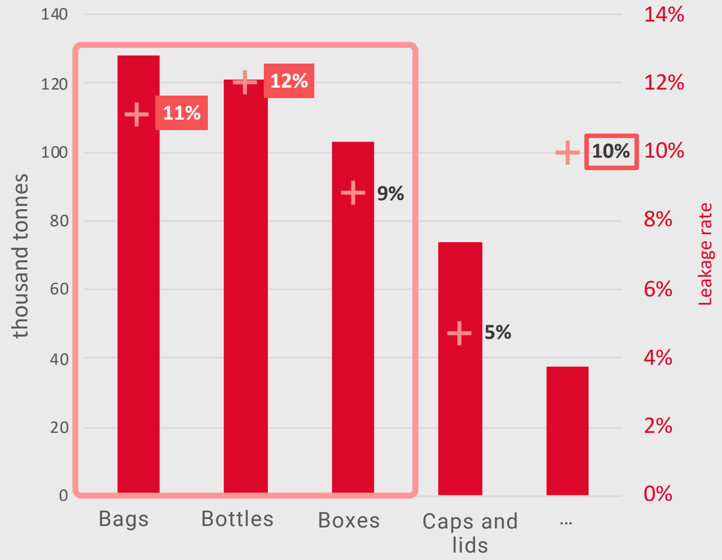


How to read the application hotspot graph?

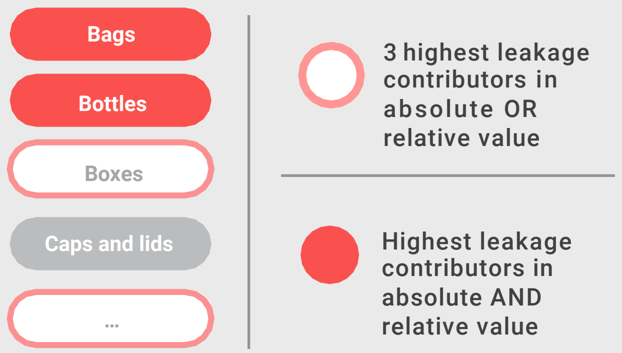
1. Determine leakage from mismanaged waste



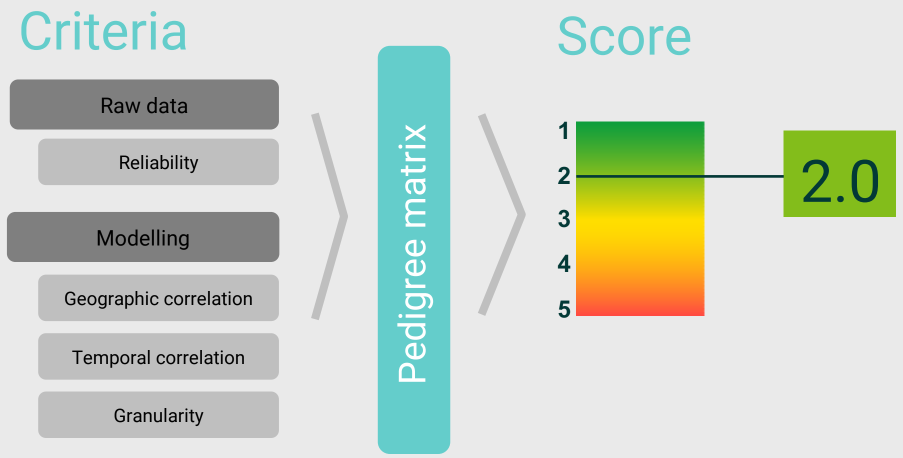
2. Focus on leakage and leakage rate



3. Select hotspots based on absolute and relative leakage



4. Assess the quality score of the results

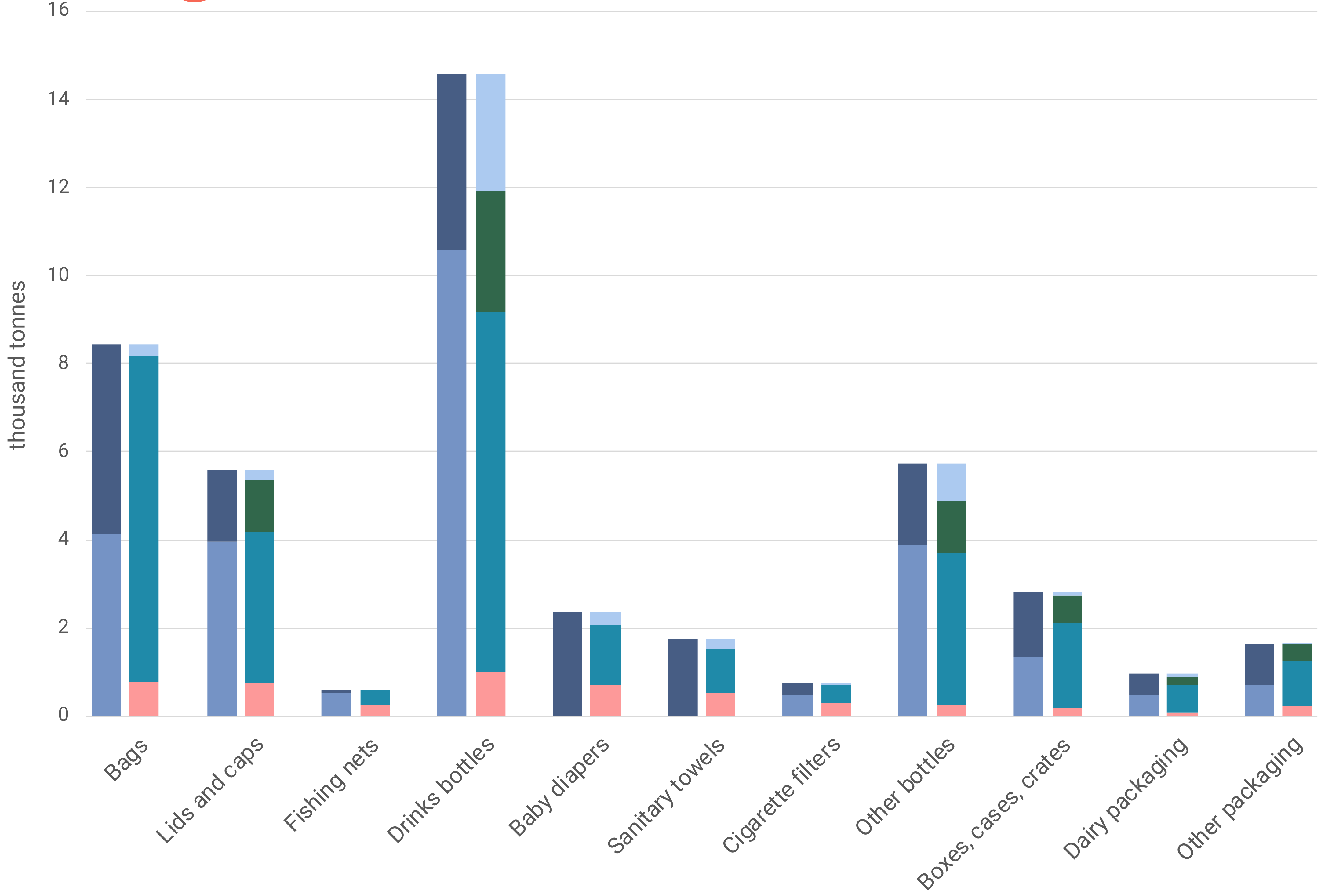


For more details, please read the Methodology

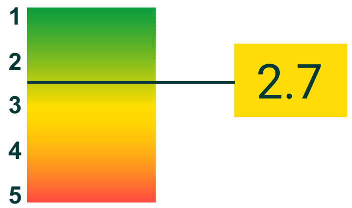
T3

MASS BALANCE BY APPLICATION [2018]

The application analysis covers most of known short-lived products (mainly related to the packaging sector), which corresponds to **44% of total plastic waste generated** in 2018.



Quality Score



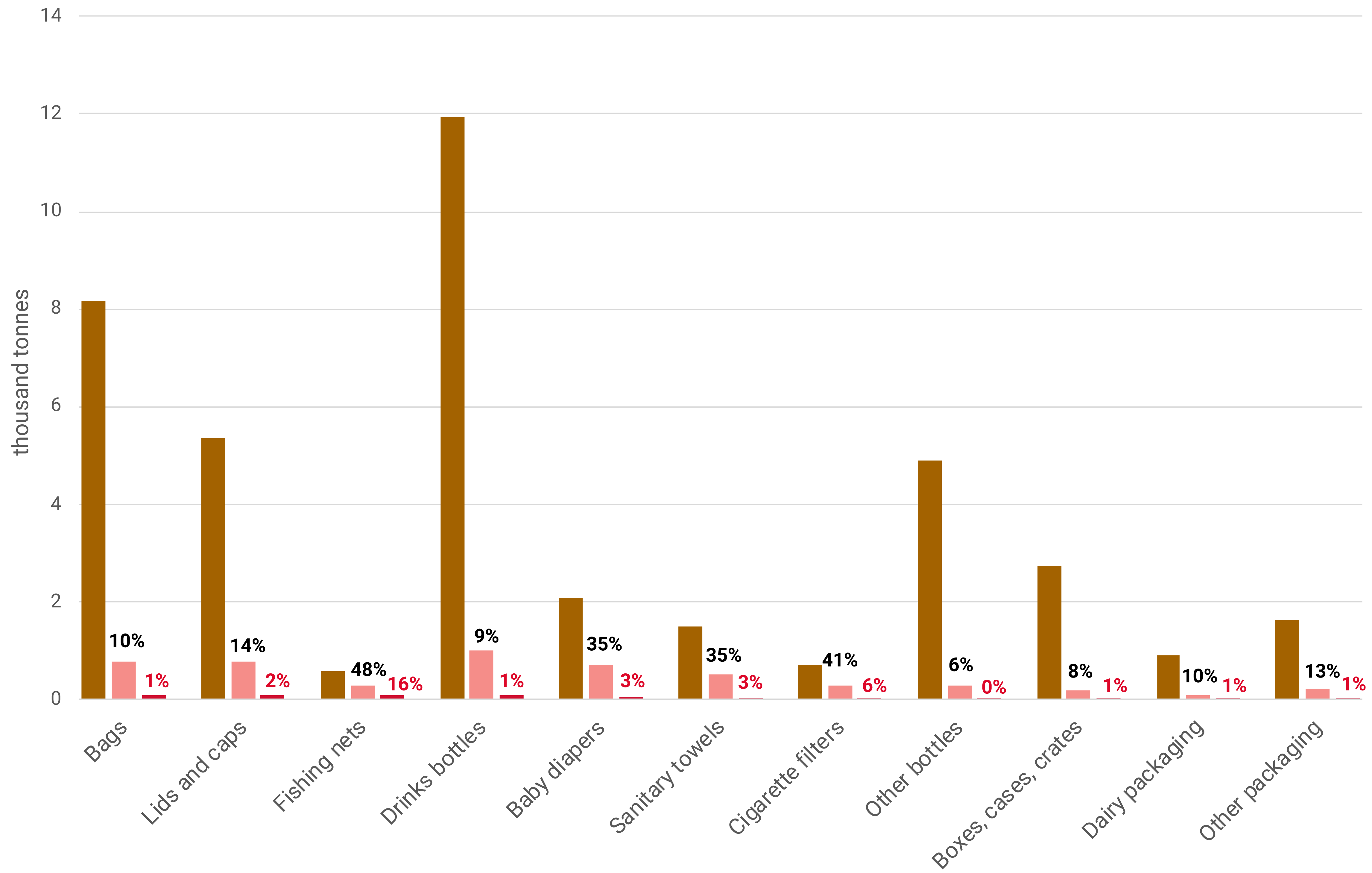
INPUT

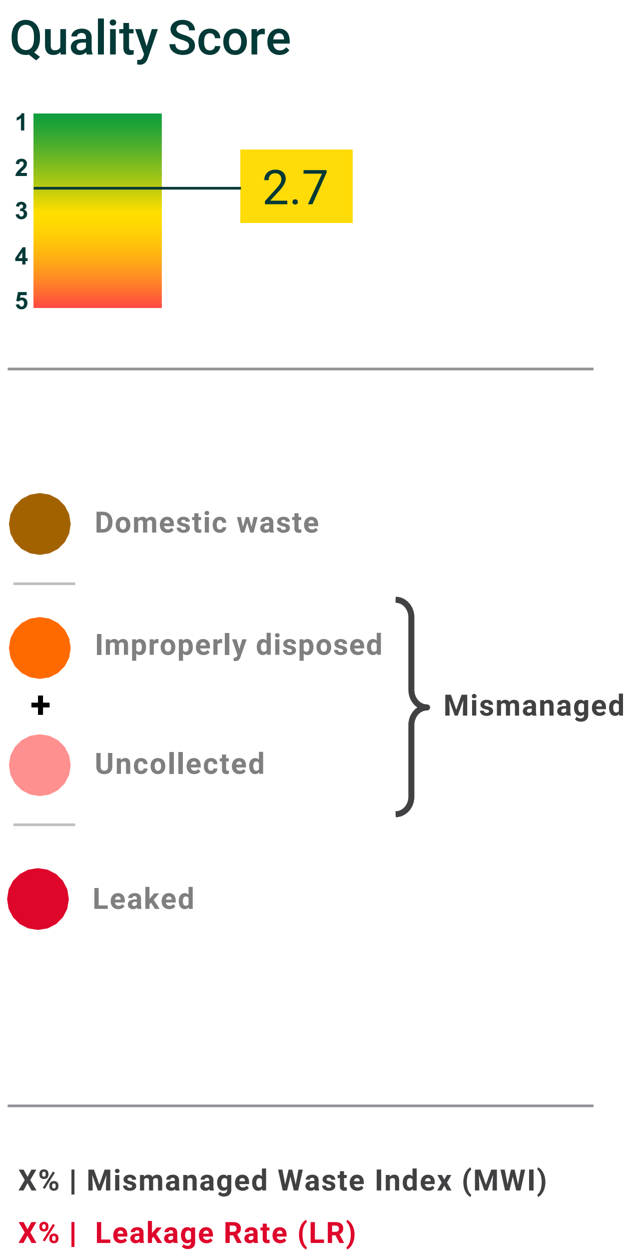
- Waste Import
- Import of products
- Production from primary

OUTPUT

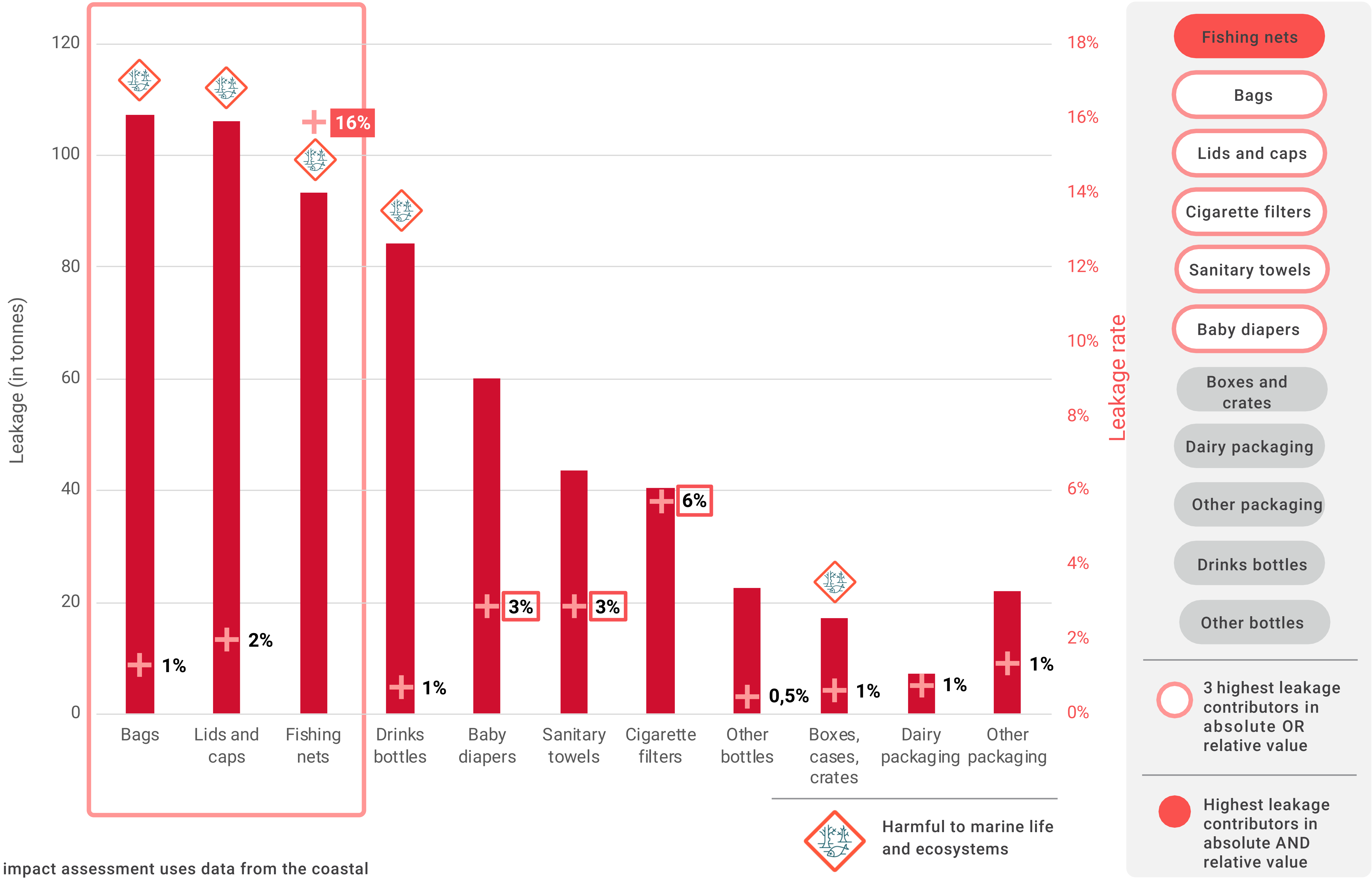
- Waste Export
- Export of applications
- Recycling
- Properly disposed
- Improperly disposed
- Uncollected

MISMANAGED WASTE AND LEAKAGE BY APPLICATION [2018]



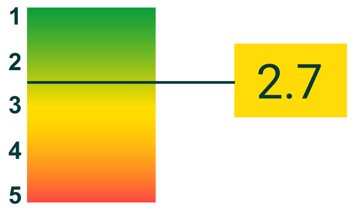


APPLICATION HOTSPOTS [2018]



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

Quality Score



Key take-aways

- **Bags** are almost on par with **lids and caps** as top contributors to plastic leakage with 107 t and 106 t respectively. However, their leakage rate are low compared to other applications.
- Fishing nets rank 3rd in absolute leakage (84 t) but 1st in relative terms with a leakage rate as high as 16%.
- Although less critical in absolute leakage, **cigarettes filters** and **sanitary products** have a relatively high leakage rate (6% and 3% respectively) compared to other applications.

All packaging applications

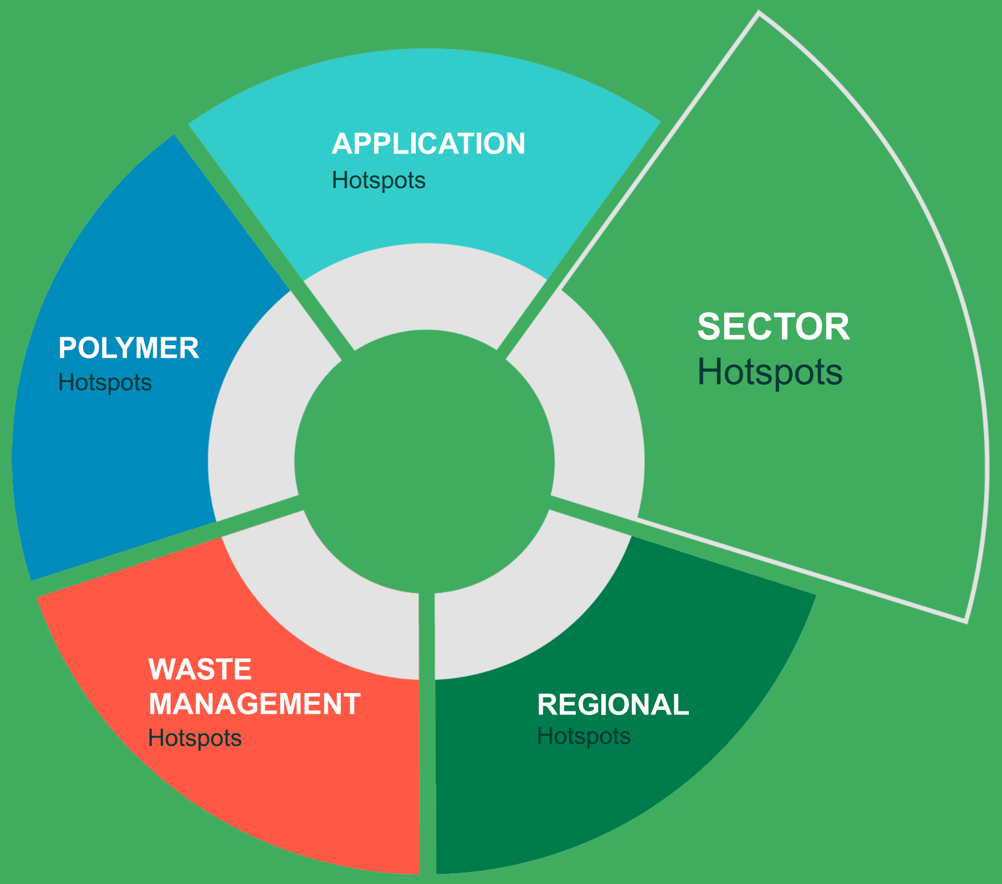
Limitations

For the applications targeted in this study, Cyprus mostly imports virgin plastic or intermediate plastics such as plates, sheets and films of plastic, that are then turned into products by local manufacturers. Usually, the lack of insights on local manufacturing and retailing of products makes it very challenging to know precisely the consumption quantities. In the case of Cyprus, for packaging, we assumed that the production of an application is proportional to the relative importance that the application has in trade, and that the total production matches the total production from the packaging sector.

Unlocking limitations

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

C SECTOR HOTSPOTS

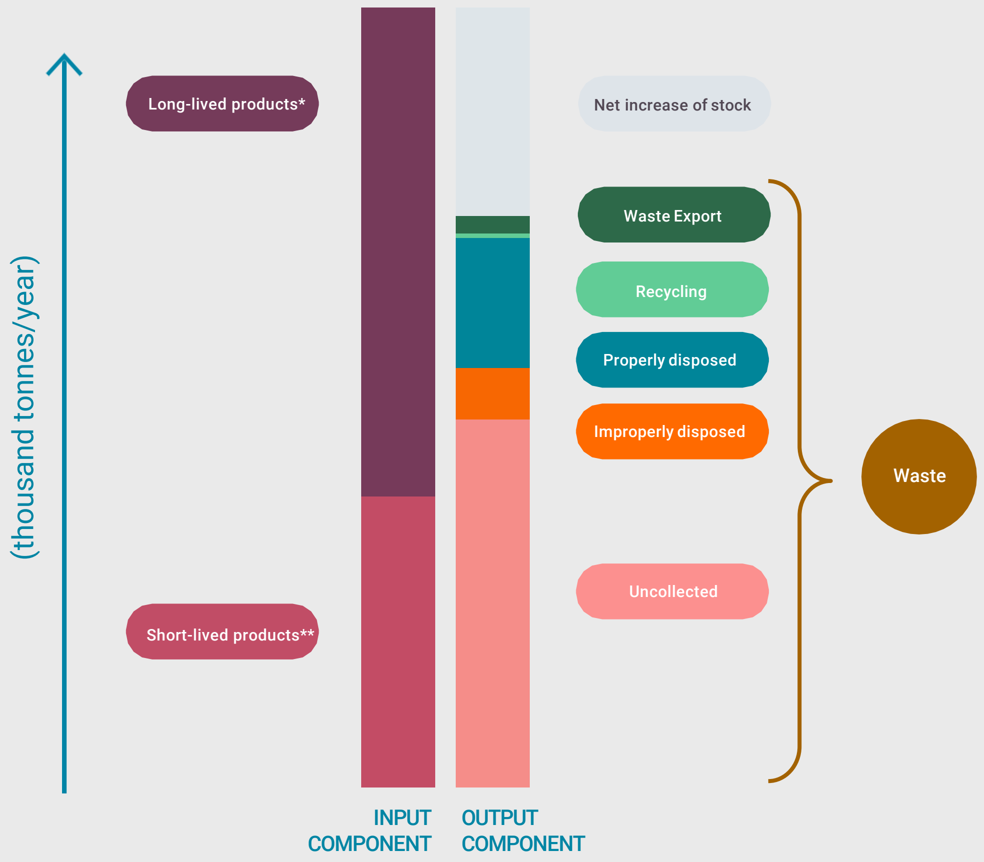


OBJECTIVE AND INSTRUCTIONS

Key question answered:

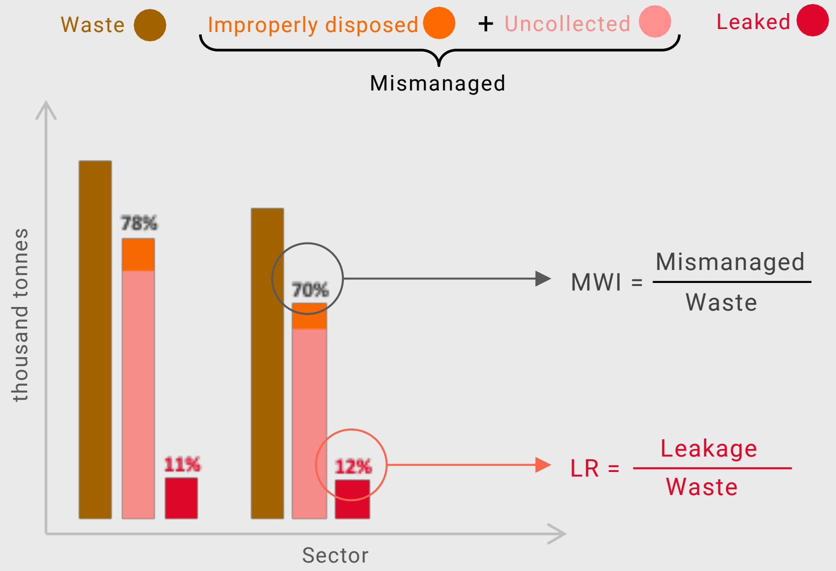
Which sectors are most critical in the country regarding plastic leakage?

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

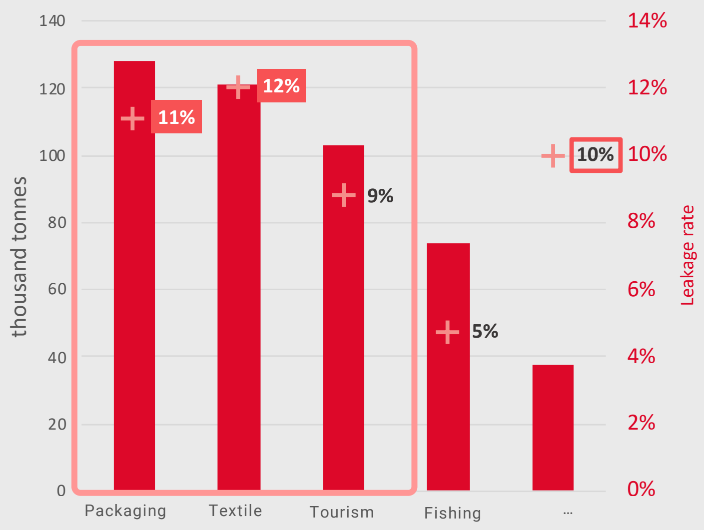


How to read the sector hotspot graph?

1. Determine leakage from mismanaged waste



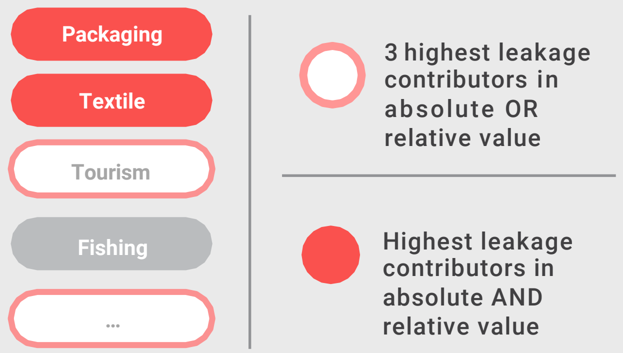
2. Focus on leakage and leakage rate



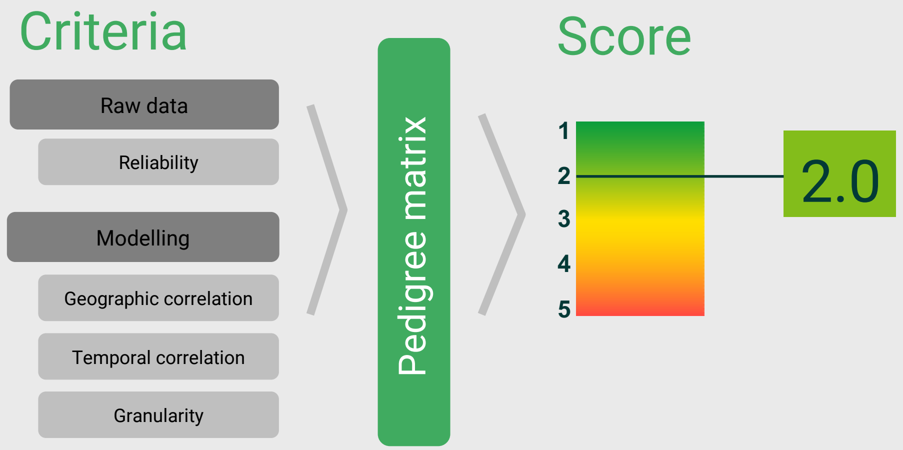
For more details, please read the Methodology

T3

3. Select hotspots based on absolute and relative leakage

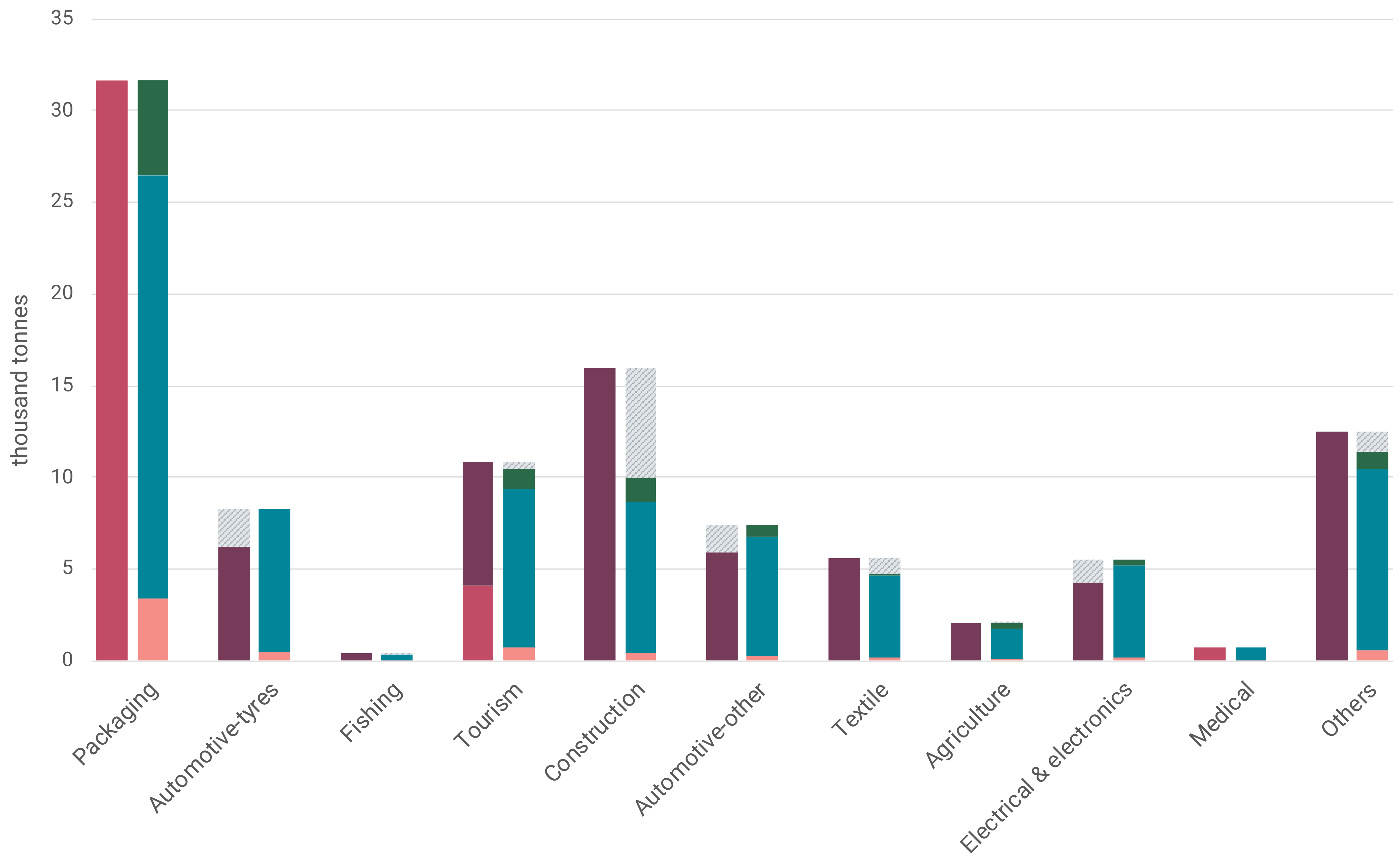


4. Assess the quality score of the results

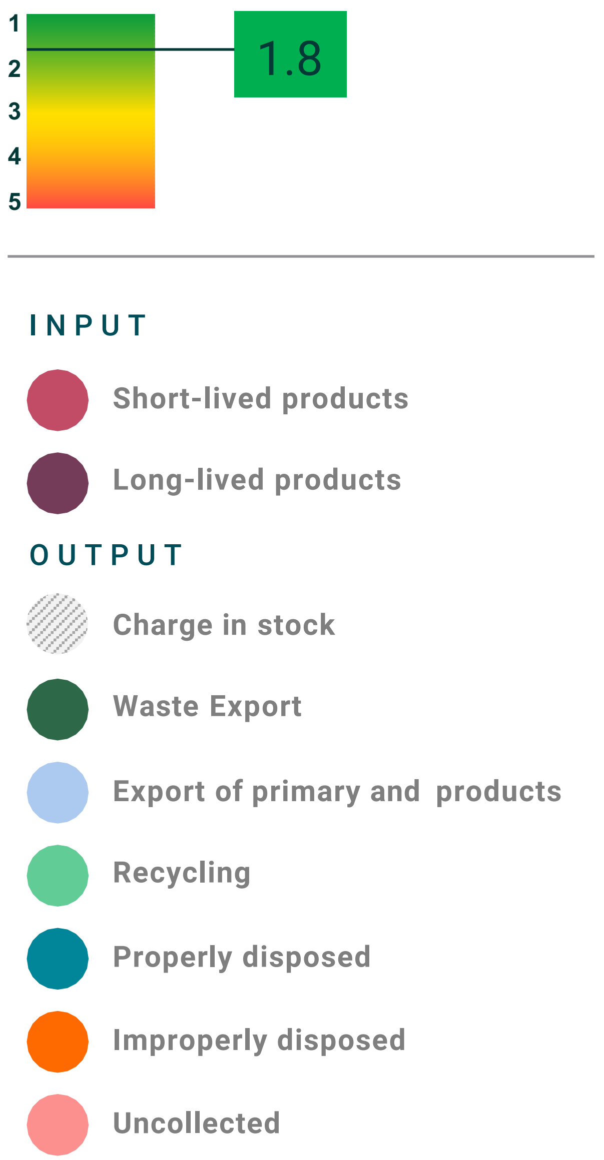


* **Short-lived products**: products that are disposed within the year of study (Life-time < 1 year)
** **Long-lived products**: products that are disposed after the year of study (Life-time > 1 year)

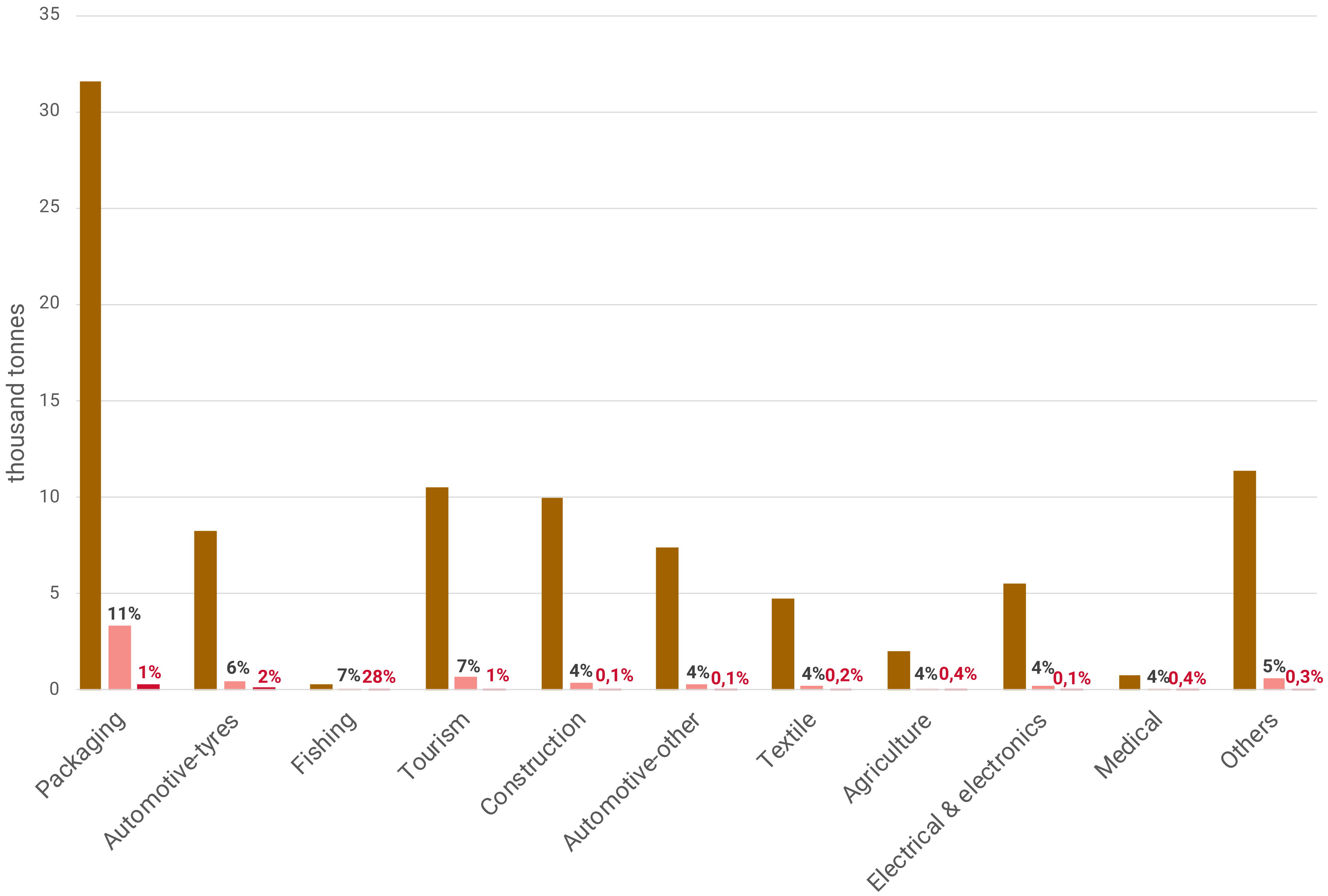
MASS BALANCE BY SECTOR [2018]



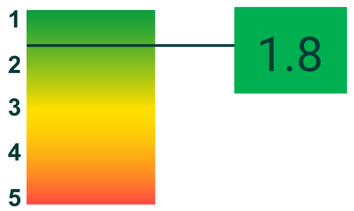
Quality Score



MISMANAGED WASTE AND LEAKAGE BY SECTOR [2018]



Quality Score



Domestic waste

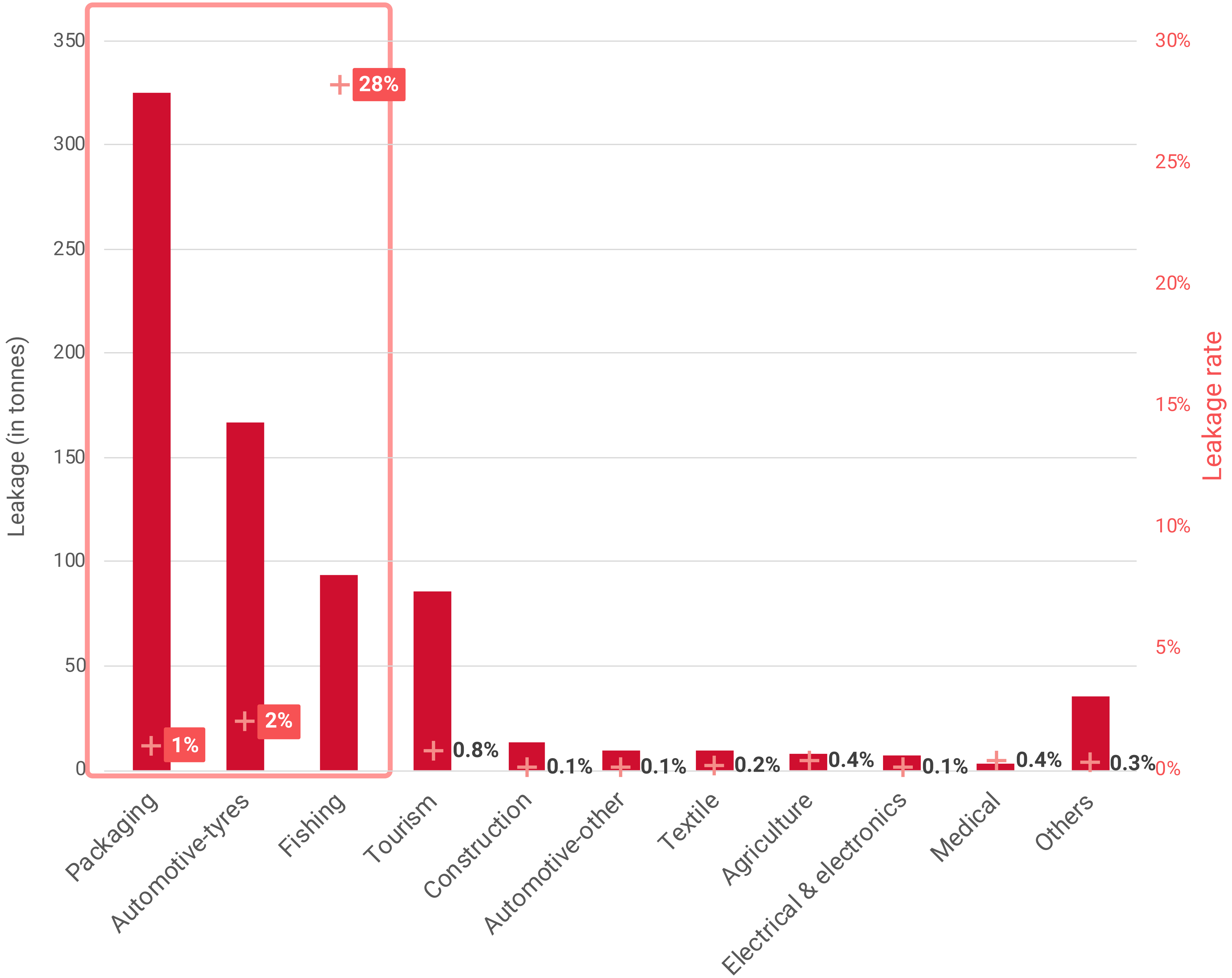
Improperly disposed
+
Uncollected
} Mismanaged

Leaked

X% | Mismanaged Waste Index (MWI)

X% | Leakage Rate (LR)

SECTOR HOTSPOTS [2018]



Packaging

Automotive-tyres

Fishing

Tourism

Construction

Automotive-other

Agriculture

Textile

Electrical & electronics

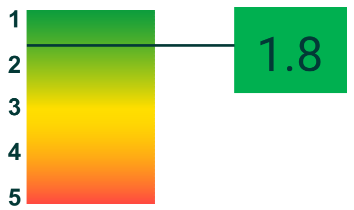
Medical

Other

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 42% of total plastic leakage with 325 t of packaging waste leaking into oceans and waterways.
- **The automotive-tyres sector** is the 2nd highest contributor to plastic leakage in absolute value (167 t), mostly due to tyre abrasion on roads.
- **Fishing** and **Tourism** sectors are close behind with 93 t and 86 t of plastic leakage respectively, although Fishing seems has a very high leakage rate (28%).

SECTOR HOTSPOTS: INTERPRETATION AND LIMITATIONS

Packaging

Learnings

Packaging is the sector with the highest absolute plastic leakage. This is due to various reasons. Firstly, packaging is the sector with the highest plastic consumption and, unlike other sectors, all the products in the packaging sector become waste within the year (no stock). Secondly, although most of the plastic collected for recycling in Cyprus comes from the packaging sector, this represents only 16% of the entire plastic packaging waste. Thirdly, plastic in packaging has one of the highest chances of littering.

Fishing

Learnings

Fishing ranks surprisingly high as it is the third sector by absolute plastic leakage and the first by leakage rate. This can be explained by the prevailing use of longlines in Cyprus which have the highest plastic weight by unit as well as the highest chances of being lost at sea (*Richardson et al., 2019*).

Limitations

The precise number of fishing gears is unknown. Thus, we are possibly overestimating the number of fishing gears that were actually used in 2018 by using the maximum length of gear authorised by license type as a default estimate of gear count.

Automotive-tyres

Learnings

The automotive-tyres sector is the second sector by absolute and relative plastic leakage. The high leakage is due to the micro-leakage coming from tyre abrasion while driving vehicles on roads.

Limitations

We did not consider any special treatment for Automotive-tyres waste, even though we know from the Department of Environment of Cyprus that there are two collective systems for the collection and treatment of waste tyres as alternative fuels. Indeed, we cannot estimate the quantity of tyres discarded through these systems, but this does not affect our result since more than 90% of leakage from the automotive-tyres sector stems from tyre abrasion during the use phase.

Unlocking limitations

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

Tourism

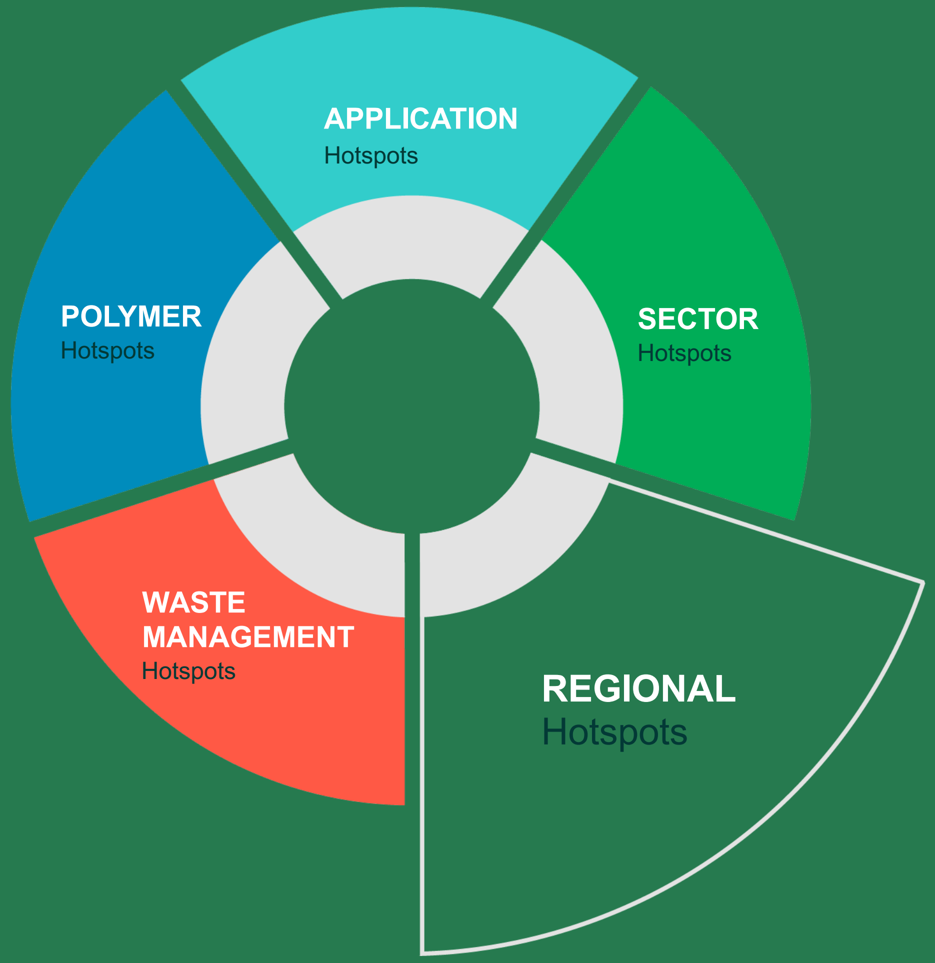
Learnings

Although not in the top three plastic leakage hotspots, the tourism sector still contributes to 11% of total plastic leakage (same share as the fishing sector). This does come as a surprise since Cyprus is a very attractive destination with almost 4 millions tourists in 2018.

Limitations

We assume that the tourism sector has an impact on every other sector which is proportional to waste generated in each sector. This means for instance that 11% of the waste produced by both the packaging sector and the automotive sector were allocated to the tourism sector.

D REGIONAL HOTSPOTS

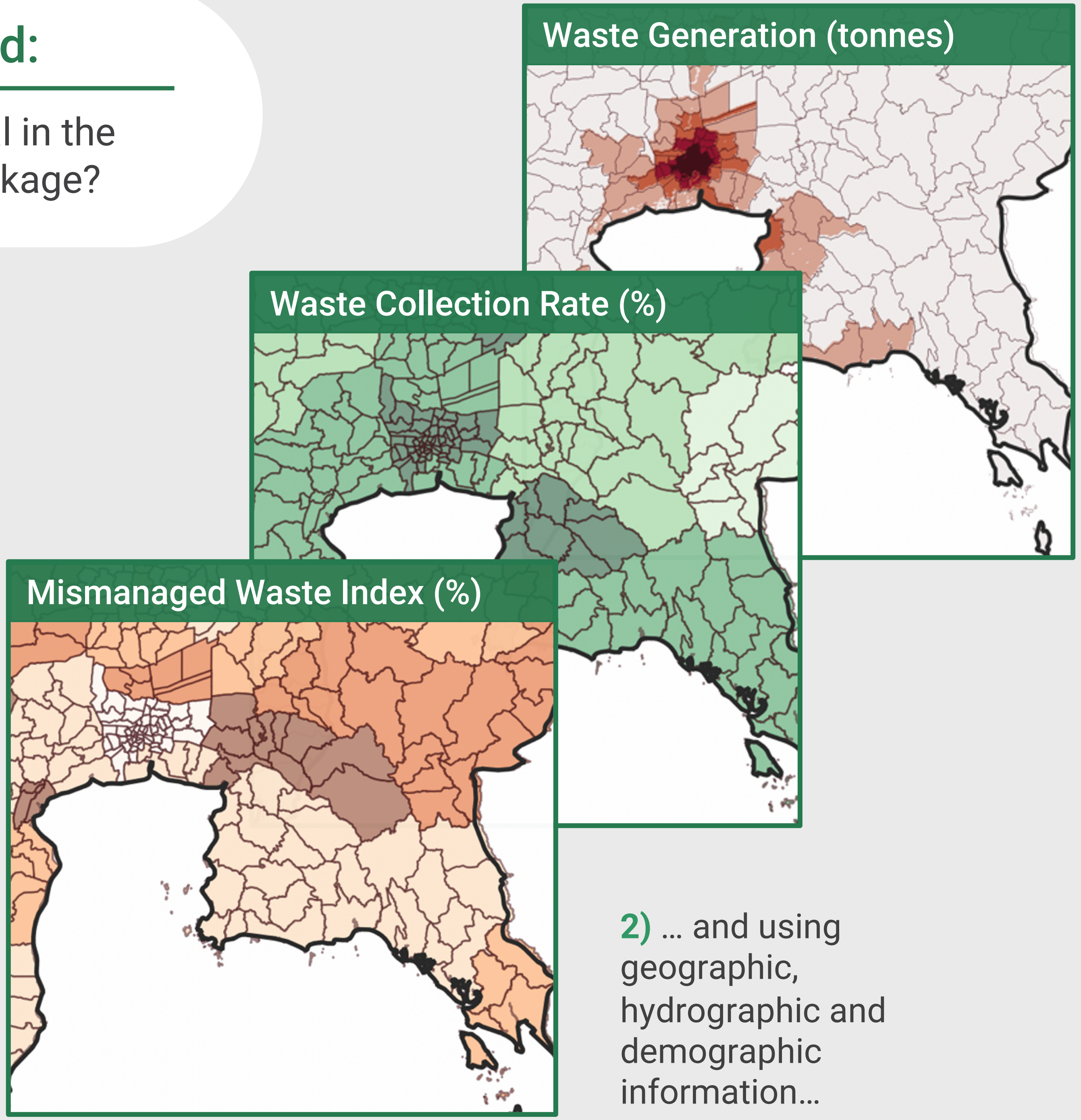


OBJECTIVE AND INSTRUCTIONS

Key question answered:

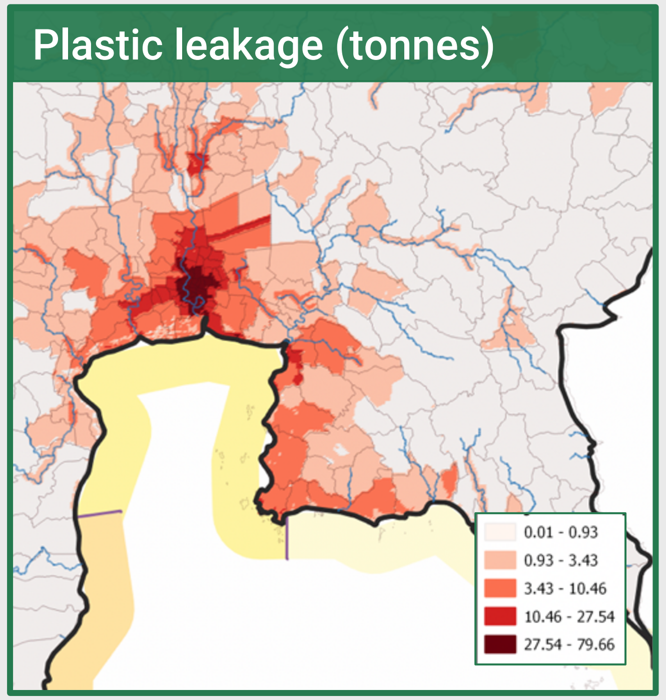
Which areas are most critical in the country regarding plastic leakage?

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

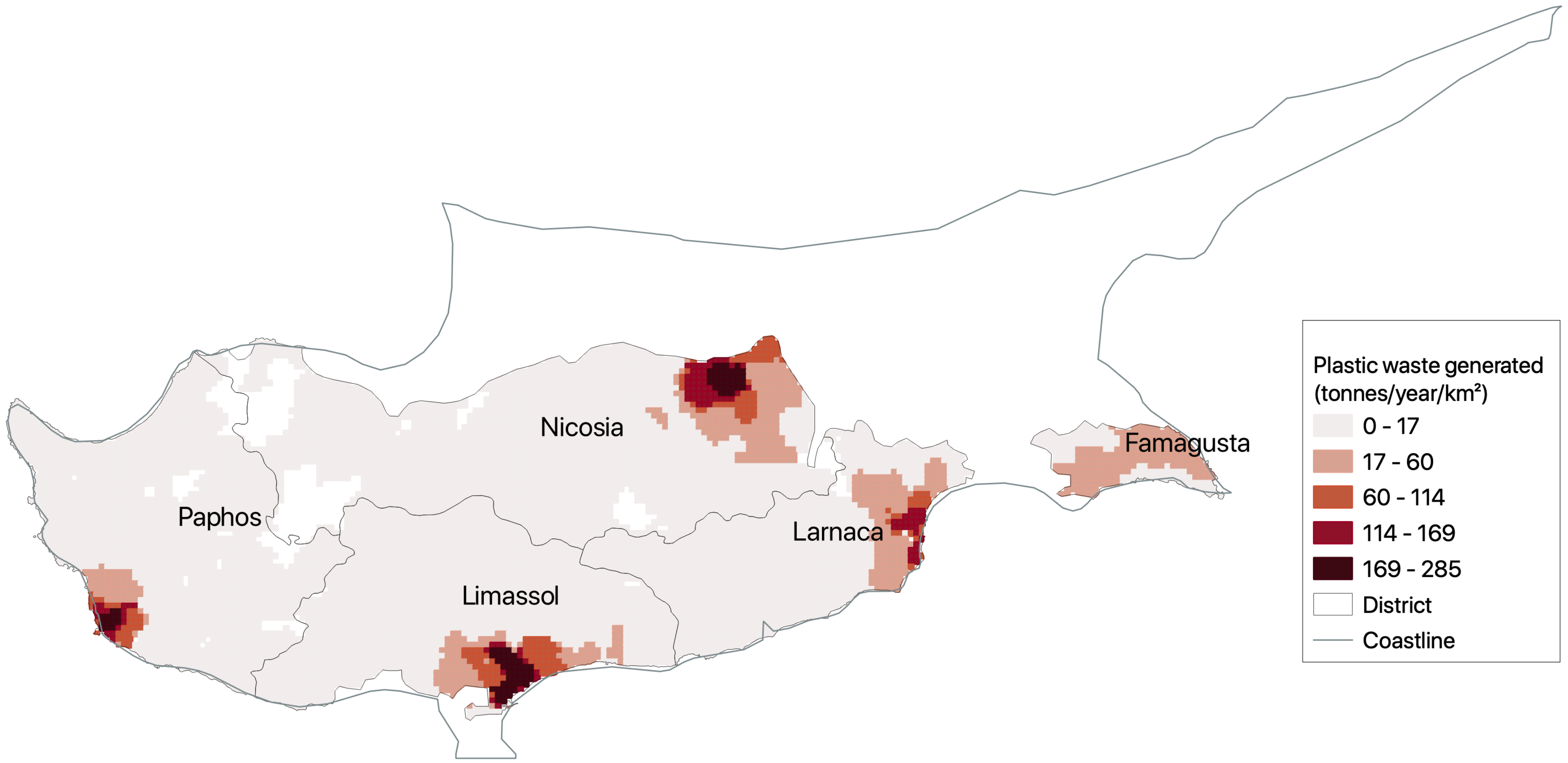


2) … and using geographic, hydrographic and demographic information…

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



WASTE GENERATION:
MAP AND INTERPRETATIONS [2018]



Key take-aways

- Plastic waste generation is concentrated around the cities of Nicosia, Limassol, Paphos and Larnaca.
- On average, plastic accounts for 15% of the total waste stream.

Limitations

Although the total value of waste generated by tourists is known by province based on the number of beds, we cannot visualise precise tourist hotspots at a pixel level due to a lack of granularity in the geographical data.

Unlocking limitations

Gather more granular data on where tourists are dwelling during stay with specific coordinate positions.

More details available in Appendices

WASTE COLLECTION: MAP AND INTERPRETATIONS [2018]

More details available in Appendices

Key take-aways

- Plastic waste collection rate hits 93% on average in Cyprus.

Limitations

Due to a lack of granular data at province level, we assume that plastic waste collection is evenly distributed across the country, which does not reflect reality.

Unlocking limitations

Since all collected waste that is not exported for recycling is disposed at landfill facilities, it is important to trace the origin of the waste ending up at each of the three Integrated Waste Management Facilities in Cyprus. This information will reveal how much plastic waste is collected in each province in addition to already known amounts of recyclables.

MISMANAGED WASTE INDEX:
MAP AND INTERPRETATIONS [2018]

Key take-aways

- The average MWI for plastic waste is 7% in Cyprus.

Learnings

As we assume that only uncollected waste contributes to mismanagement, the map shown for MWI is the mirror of the waste collection map.

Limitations

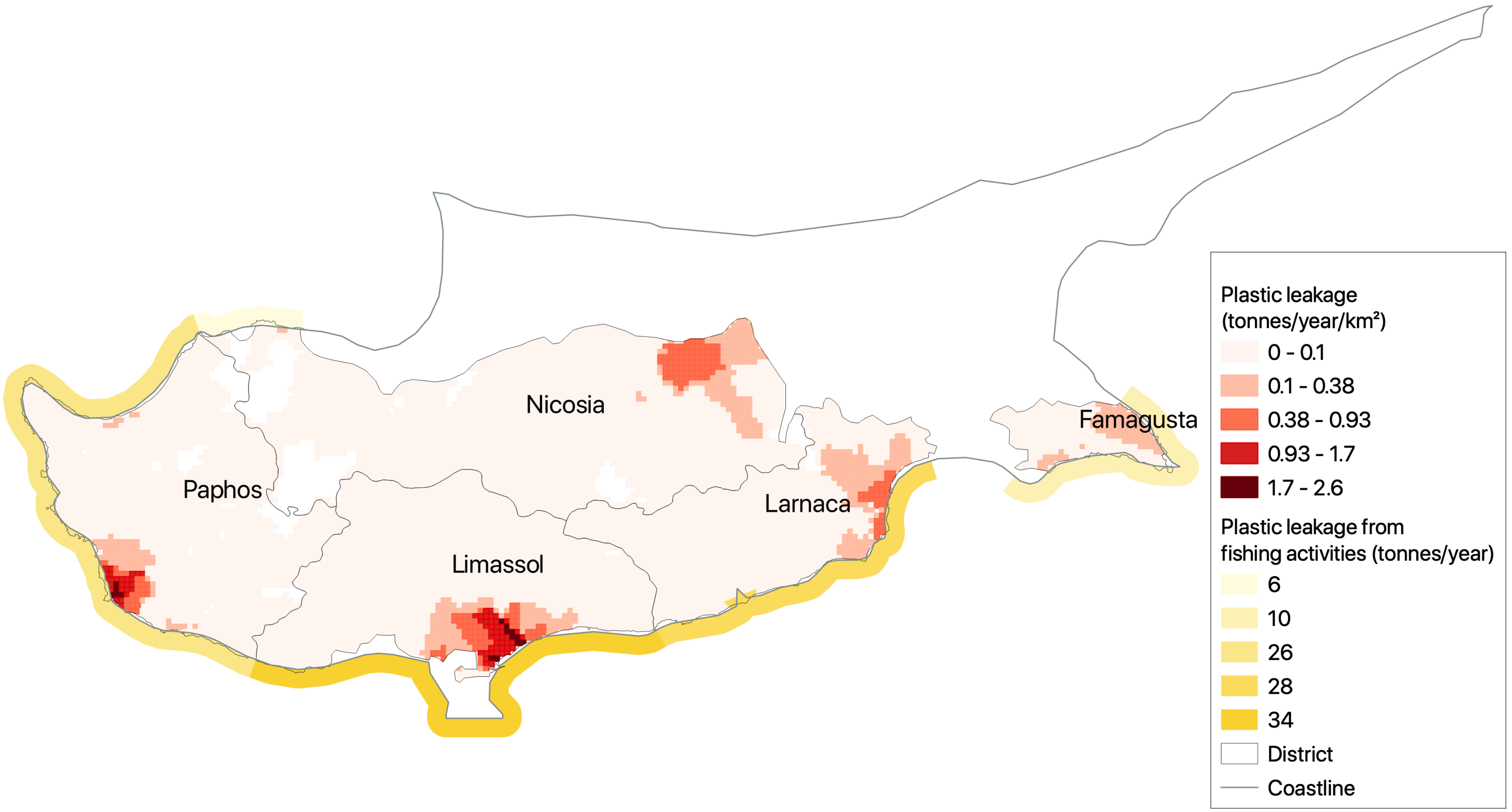
Due to a lack of granular data at province level, we assume that plastic waste mismanagement is evenly distributed across the country, which does not reflect the reality.

Unlocking limitations

Improve data from Integrated Waste Management Facilities.

More details available in Appendices

REGIONAL LEAKAGE:
MAP AND INTERPRETATIONS [2018]



Key take-aways

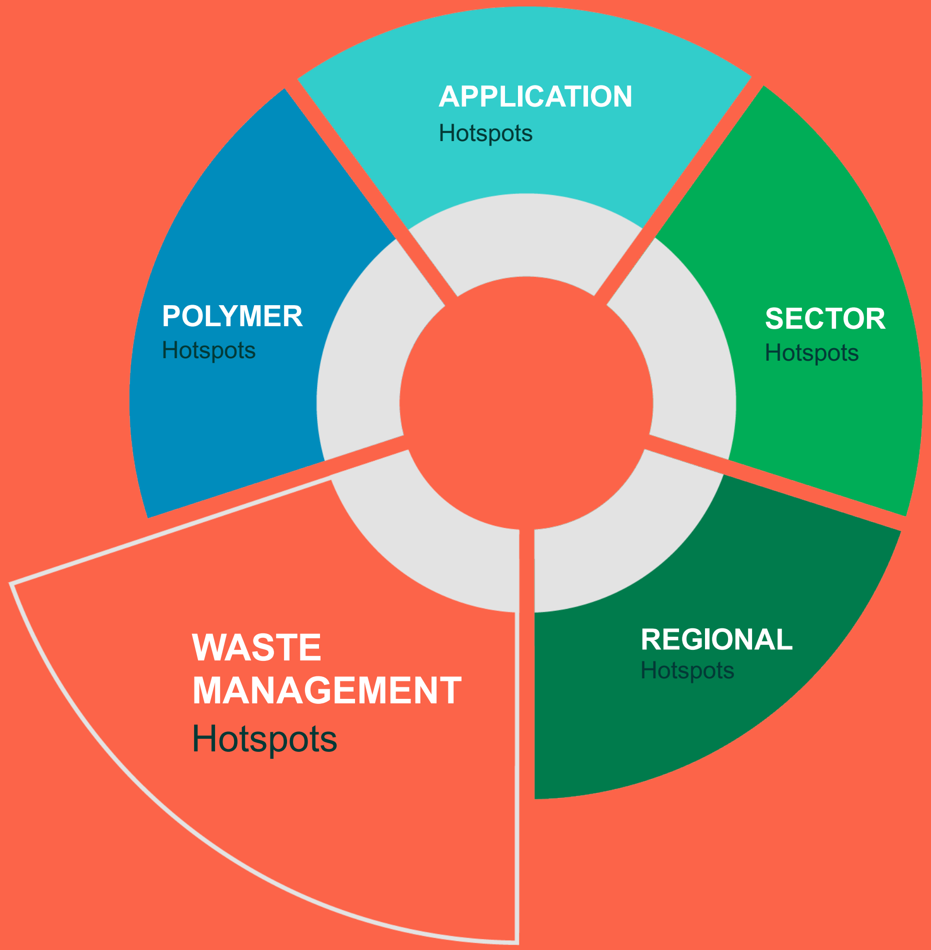
- Annual leakage of mismanaged waste: 466 tonnes
- Annual leakage from mismanaged/lost at sea fishing gears and from overboard littering: 93 tonnes.

Learnings

- Similarly to plastic waste generation, leakage hotspots are located around cities of Nicosia, Limassol, Paphos and Larnaca. However leakage density (per km^2) is more important in cities and surroundings of Limassol and Paphos.
- Fishing vessels and fishermen are likely to substantially contribute to plastic leakage in Cyprus (12% of total leakage).

More details available in Appendices

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 hotspot		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% in 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

WASTE **GENERATION**	Plastic waste import	Plastic waste export	Plastic waste per capita generation	Share of plastic in waste stream
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
WASTE MANAGEMENT **INFRASTRUCTURE**	Share of waste in dumpsites	Share of waste in 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

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

T4

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
COLLECTION	WASTE **COLLECTION**	Formal collection of municipal waste	Formal collection of industrial waste	Value of recycled plastics	Value of non-recycled plastics
COLLECTION	LEAKAGE WHILE **WAITING FOR COLLECTION**	Design of waste bins	Frequency of collection	Climatic conditions	Other (e.g. animals)
COLLECTION	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
END-OF-LIFE	**POST-LEAKAGE** MANAGEMENT	Frequency of city cleaning and sweeping	Frequency of waterway cleaning	Frequency of coastal clean-up	Frequency of other clean-up activities
END-OF-LIFE	**WASTE WATER** MANAGEMENT	Management of run-off waters	Waste water collection	Waste water treatment efficiency	Fate of WWTP sludges

For more details and justifications, check tool T4.1

Negative contribution to the leakage

Neutral contribution

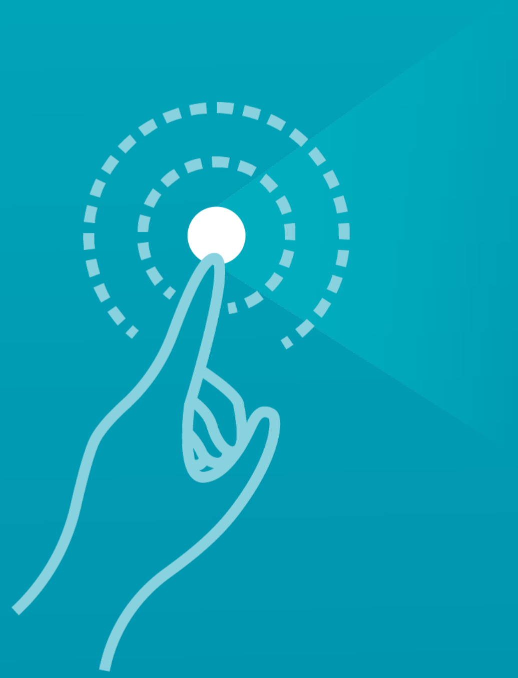
Positive contribution

Not assessed

Key take-aways

- Plastic waste generation per capita (94 kg/cap/year) is above the Western Europe average (64 kg/cap.year) and the share of plastic in the waste stream is high (16%).
- Waste collection rate (93%) is below average in high income countries 96%*.
- There is a lack of adequately designed bins and they are not emptied on a regular basis.
- In 2018, Cyprus had no recycling capacity on its territory.
- There is a significant export of plastic waste (around 9% of the total) to countries with lower waste management standards (for instance Indonesia and India).
- Some positive aspects are the absence of unsanitary landfills, a high share of waste water collection and treatment, and low volumes of plastic waste import.

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



2.3 ACTIONABLE HOTSPOTS

HOTSPOTS IN BRIEF

Polymer

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

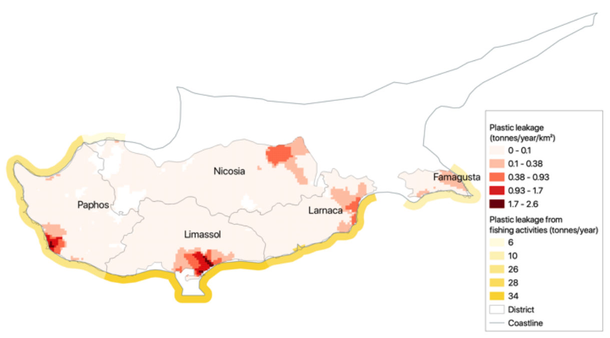
Application

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

Sector

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

Regional



3 highest leakage contributors in absolute OR relative value

Highest leakage contributors in absolute AND relative value

Waste management

WASTE GENERATION	Plastic waste import	Plastic waste export	Plastic waste per capita generation	Share of plastic in waste stream
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
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

Positive contribution

Neutral contribution

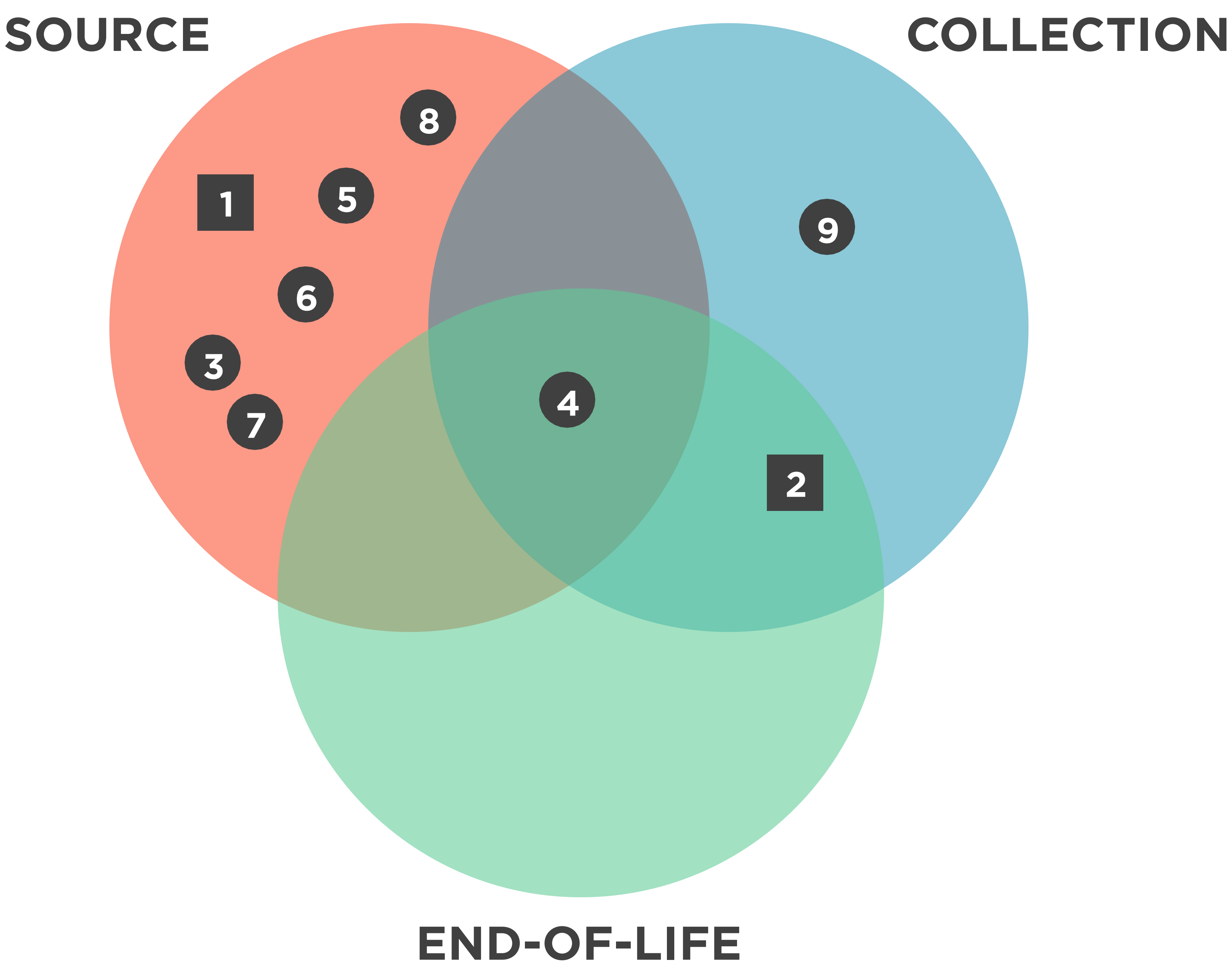
Not assessed

ACTIONABLE HOTSPOTS LIST

[#]	[ACTIONABLE HOTSPOT]	[■/●]
1	Plastic generation per capita in Cyprus is well above Western Europe average and plastic share in waste stream is increasing over the years due to a plastic consumption on the rise.	■
2	All type of plastics are leaking in Cyprus due to low levels of segregation at source and a lack of incentives for recycling plastic.	■
3	Synthetic Rubber is the most leaking polymer in Cyprus due to tyre abrasion caused by high use of road vehicles.	●
4	PET and LDPE, used for example in bottles or bags respectively, are seriously leaking in Cyprus because of a high consumption, lack of recycling incentives, and littering behaviours.	●
5	Plastic bags are the most leaking application (among those covered in the analysis) in Cyprus as it is the second most consumed application in the country and has high release potential in waterways after loss.	●
6	Packaging is the most leaking sector in Cyprus that consumes important quantities of plastic and covers products with high leakage potential.	●
7	Tourism has a relatively high leakage impact due to a high number of tourists who probably consume more single-use plastics with a high leakage potential.	●
8	Paphos and Larnaka are the most critical areas for plastic leakage per km^2 due to high population density.	●
9	Plastic waste is leaking because of a lack of adequately designed bins and a low waste collection frequency in some areas.	●

■ **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 Cyprus calls for actions concentrated on the source of plastic rather than its collection or end-of-life.

■ **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

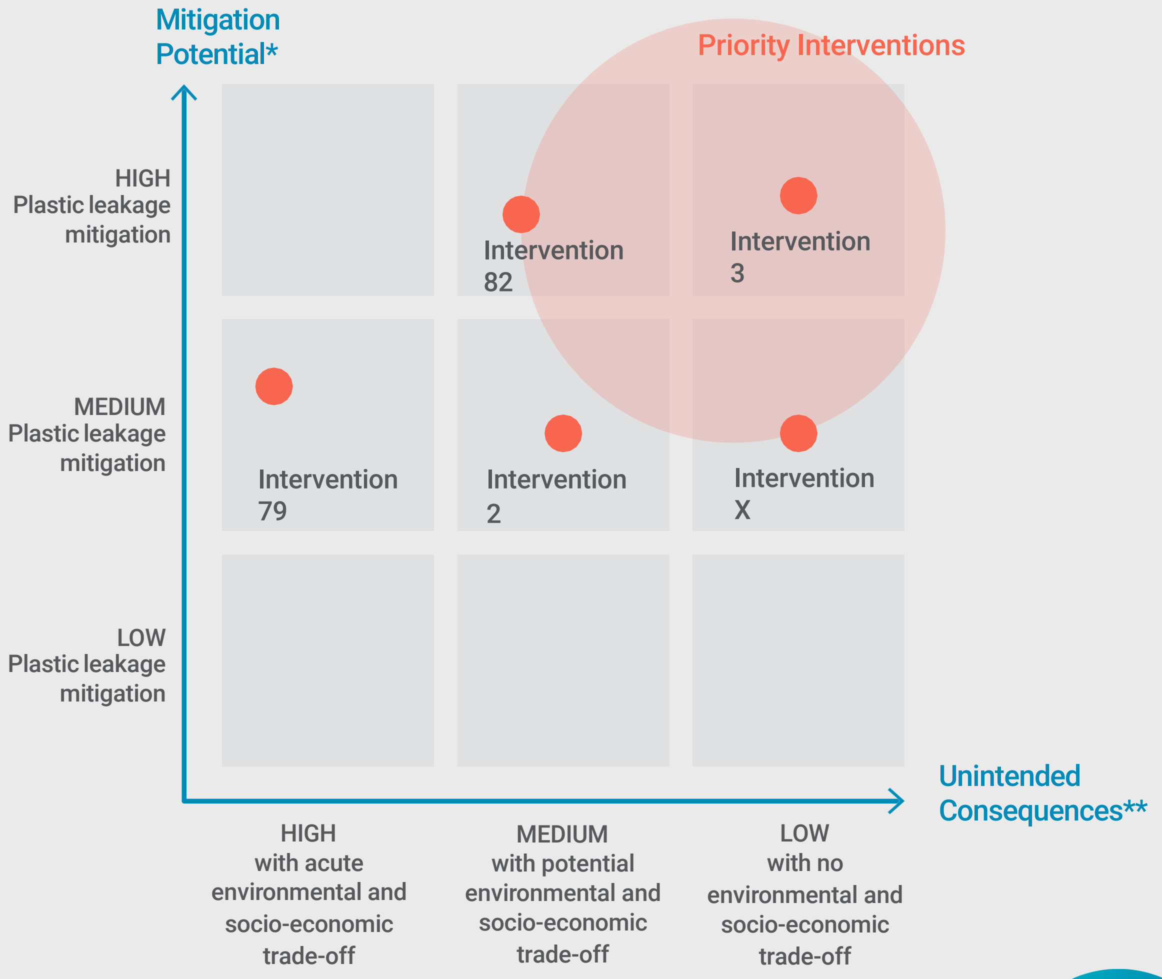
STEP 1: choose up to 3 interventions for each actionable hotspot

STEP 2: assess criteria levels for each chosen intervention

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

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

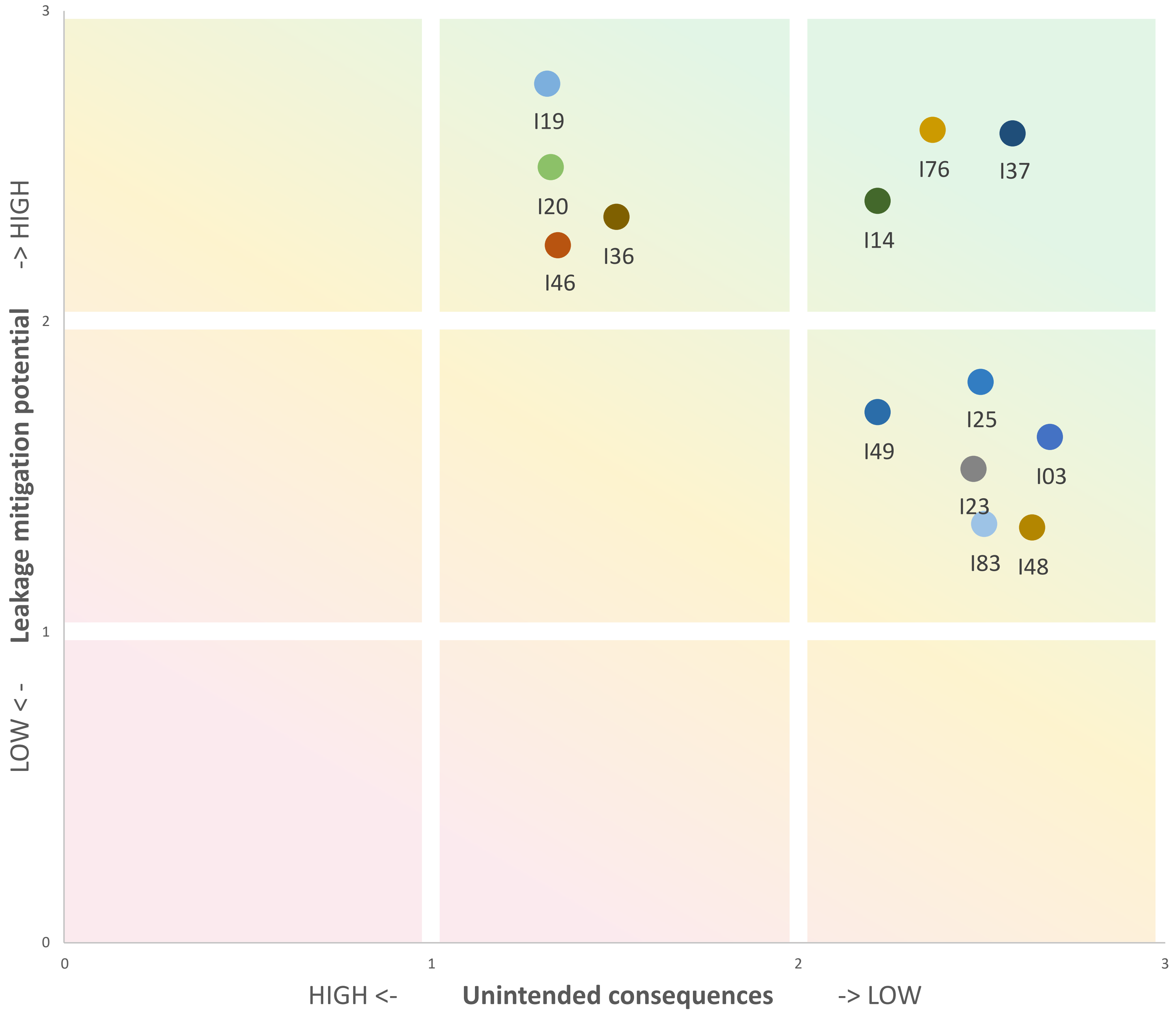
Interventions (I)	Leakage mitigation potential*	Unintended consequences**
I1		
I2	medium	medium
I3	high	low
I4		
I5		
...		
I79	medium	high
I80		
I81		
I82	high	medium
I83		



* **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).

PRELIMINARY SELECTION OF INTERVENTIONS

Prioritisation of interventions



- I03: Increase recycling capacity for domestic plastic waste (all polymers)
- I14: Reduce littering in urban areas
- I19: Reduce demand for, and use of, single-use, especially on-the-go, plastics
- I20: Reduce tyre abrasion
- I23: Increase demand for recycled material in the country (LDPE)
- I25: Increase demand for recycled material in the country (PET)
- I36: Promote design of material or process that substitute plastic by other material based on life cycle assessment
- I37: Promote design of material or process that favour reuse of plastic objects (e.g. deposit scheme)
- 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)
- I76: Reduce losses from waste management equipment (bins, transport)
- 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 authors 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.

RE-DESIGN	SUSTAINABLE PRODUCTION	Design plastic products with highly recoverable and recyclable materials while improving reusability and repairability, and rethink sustainable business models to minimise risks of plastic leakage	PRODUCT MANUFACTURING AND USE
REDUCE	SUSTAINABLE CONSUMPTION AND LIFESTYLES	Reduce demand for & use of problematic or unnecessary plastic materials and products	
RECUPERATE	WASTE COLLECTION SYSTEMS	Maximise collection of plastic waste	WASTE INFRASTRUCTURE AND MANAGEMENT
RENOVATE	WASTE INFRASTRUCTURE	Build capacity to increase efficiency of proper treatment and final disposal	
RECYCLE	PLASTIC RECYCLING	Increase recycling rates through design and infrastructure that facilitate better segregation, collection, disassembly, recycling and recovery	
REMOVE	CLEAN-UP SOLUTIONS	Post-leakage cleaning of the environment	POST LEAKAGE MANAGEMENT

S2

PRELIMINARY PRIORITY INTERVENTIONS LIST

[INTERVENTION CLASS]	[PRIORITY INTERVENTION]	[CODE]
SUSTAINABLE PRODUCTION	Increase demand for recycled material in the country (LDPE)	I23
	Increase demand for recycled material in the country (PET)	I25
	Promote design of material or process that substitute plastic by other material based on life cycle assessment	I36
	Promote design of material or process that favour reuse of plastic objects (e.g. deposit scheme)	I37
SUSTAINABLE CONSUMPTION AND LIFESTYLES	Reduce littering in urban areas	I14
	Reduce demand for, and use of, single-use, especially on-the-go, plastics	I19
	Reduce tyre abrasion	I20
WASTE COLLECTION SYSTEMS	Plan more frequent waste collection in areas prone to plastic leakage (taxi stations, informal settlements, …)	I46
	Increase plastic segregation at household level	I48
	Increase plastic segregation in public space (sorting waste bins)	I49
WASTE INFRASTRUCTURE	Reduce losses from waste management equipment (bins, transport)	I76
	Increase density of waste bins in specific areas prone to leakage	I83
PLASTIC RECYCLING	Increase recycling capacity for domestic plastic waste (all polymers)	I03

3.2 INSTRUMENTS

METHODOLOGY FOR IDENTIFYING INSTRUMENTS

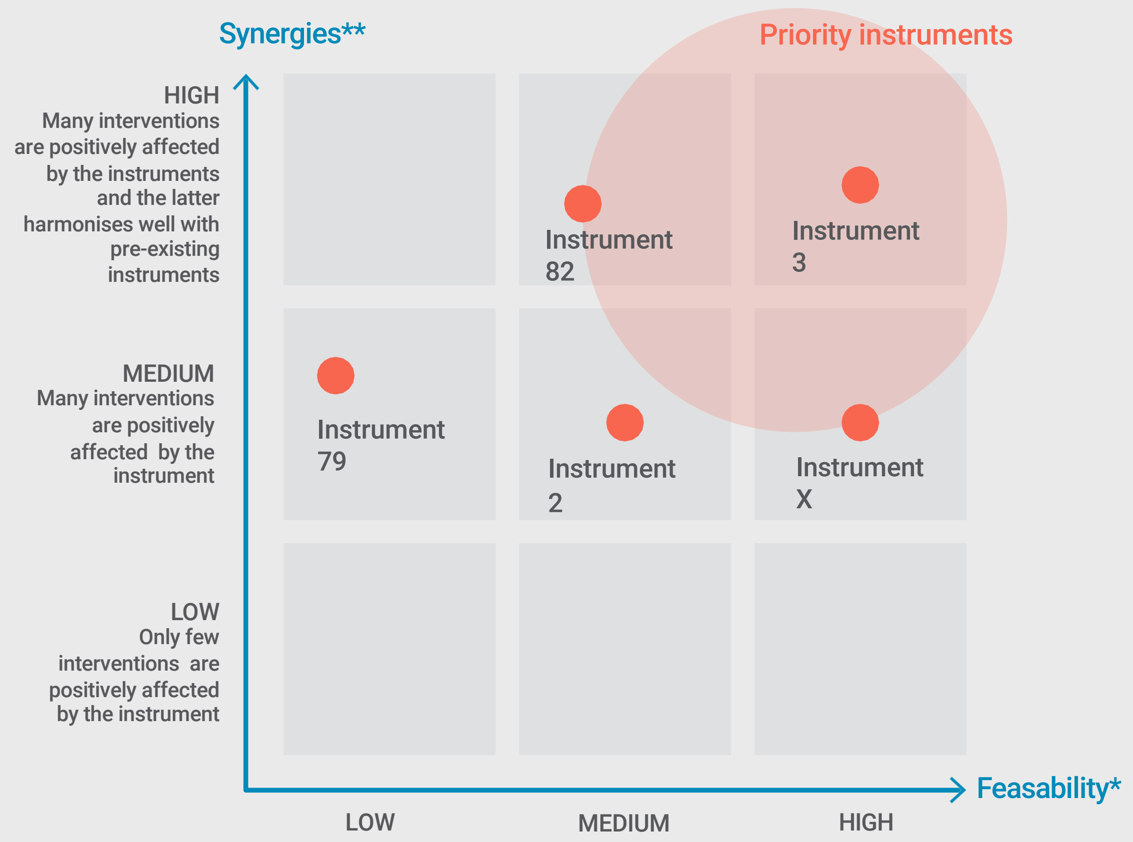
STEP 1: choose up to 3 instruments for each intervention selected in S2

Intervention (I)
I2
I3
...
I79
I82

STEP 2: assess criteria levels for each chosen instrument

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

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



* **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

INSTRUMENTS

- Knowledge creation
  - Database
  - Mapping
  - Expertise
- Awareness raising
  - Businesses
  - Citizens
  - Waste sector
- Capacity building
  - Partnership
  - Structuration
- Innovation
  - R&D
  - Social
  - Technology fisheries
  - Technology microplastics
  - Technology waste
- Economic
  - Incentive
  - Informal sector
  - Investment
  - New business models
  - Tax
- Policy / Regulatory
  - Ban
  - Extended producer responsability (EPR)
  - Enforcement
  - Industry regulation
  - Municipality regulation
  - Trade regulation
  - Waste sector regulation
  - Standardisation
  - Monitoring

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	9	0%	18%	72%	0%	11%	100%	89%	11%	1%	9	0%
PP	11	0%	18%	75%	0%	7%	100%	93%	7%	1%	11	0%
Polyester	6	0%	0%	96%	0%	4%	100%	96%	4%	0%	6	0%
LDPE	11	0%	18%	74%	0%	9%	100%	91%	9%	1%	11	0%
HDPE	15	0%	19%	73%	0%	8%	100%	92%	8%	1%	15	0%
PS	7	0%	0%	94%	0%	6%	100%	94%	6%	1%	7	0%
Other	18	0%	0%	96%	0%	6%	102%	96%	6%	0%	18	0%
Synthetic Rubber	9	0%	0%	94%	0%	6%	100%	94%	6%	2%	9	0%
PVC	6	0%	24%	72%	0%	4%	100%	96%	4%	0%	6	0%
Average	-	0%	11%	83%	0%	7%	100%	93%	7%	1%	10	0%

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

WASTE MANAGEMENT BY PROVINCE

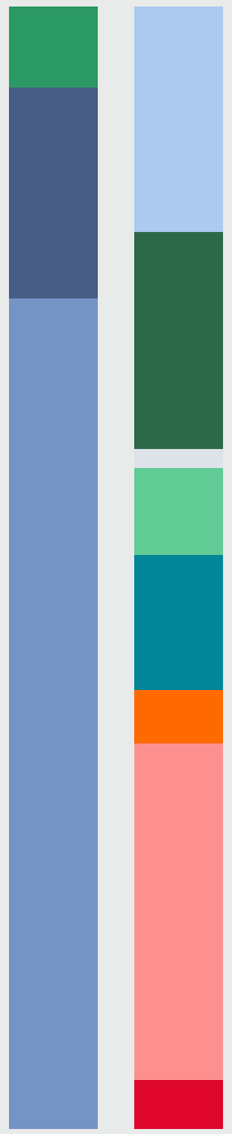
Province	Population 2020	Generated t	Collected t	Properly disposed t	Improperly disposed t	Uncollected t	Mismanaged t	Leaked t	Generated kg/cap/yr	Collected kg/cap/yr	Mismanaged kg/cap/yr	Share of Collected	Share of Mismanaged	Leakage rate
Limassol	264 852	25 960	24 154	24 154	- 0	1 806	1 806	167	98	91	7	93%	7%	0,6%
Nicosia	338 902	32 363	30 112	30 112	0	2 252	2 252	114	95	89	7	93%	7%	0,4%
Paphos	117 960	12 888	11 992	11 992	- 0	897	897	99	109	102	8	93%	7%	0,8%
Larnaca	152 859	14 964	13 923	13 923	0	1 041	1 041	60	98	91	7	93%	7%	0,4%
Famagusta	47 644	6 412	5 966	5 966	- 0	446	446	25	135	125	9	93%	7%	0,4%

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

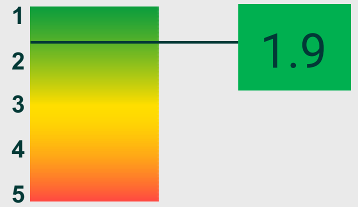
4.2 DATA QUALITY ASSESSMENT

POLYMER HOTSPOTS
DATA QUALITY ASSESSMENT (1/2)

Raw data	Reliability	Temporal		Geographic		Granularity		Final metric	Score
*UN, 2020, COMTRADE database** | *Import of waste by polymer*	2	2018	1	-	1	Waste imported comes from Comtrade (sent to incineration)	2	Import of waste	2
This study - Polymer | Import of waste	2	2018	1	-	1	Recycling of imported = import of waste	2	Recycling of imported waste***	2
*UN, 2020,, COMTRADE database** | Import products (sometimes polymer is unknown)	2	2018	1	When polymer is not specified: PlasticsEurope matrix used to assign polymer based on sector.	1	See Comtrade flowchart	2	Import of products	2
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
PlasticsEurope, 2018 |Polymers to Sectors correspondence matrix	1								
*UN, 2020, COMTRADE database** | Import of primary by polymer	2	2018	1	-	1	Production: ICIS data + Import of primary from comtrade (see comtrade flowchart)	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	2	2018	1	Mapping from Sector to Polymer based on EU, but adapted through VN net input by polymer	2,5	-	1	Change in stock	2,5
This Study - Polymer | Net input	1,9								



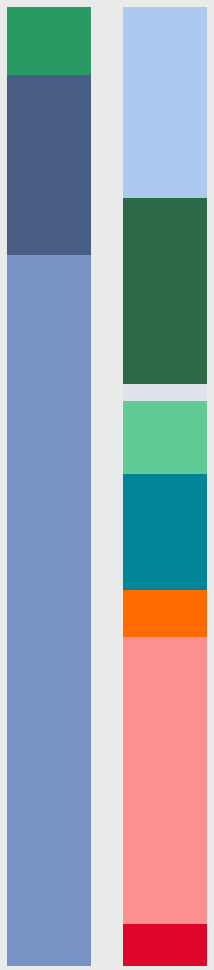
Quality Score



* Data as reported by Cyprus to UN
** 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)

Raw data – Reliability		Modelling – Temporal		Modelling – Geographic		Modelling – Granularity		Final metric	Score
Statistical Service of Cyprus, 2019| Total plastic collected for recycling	1	2018	1	-	1	No domestic recycling of waste, all waste collected for recycling is exported. The imported waste is incinerated. Waste export for recyclable polymers = non-littered waste / tot non-littered waste for recyclable polymer * Tot plastic collected for recycling. The underlying hypothesis is that what makes a polymer more or less likely to be recycled is whether it is recyclable and its chance of being littered	2	Export of waste	2
Ministry of Agriculture, 2015 | Most of the waste collected for recycling comes from segregated waste	2							Domestic recycling of collected waste***	2,0
This study - Sector| Littering of waste by sector (based on PLP)	3								
This study - Sector| Properly disposed per sector	2,0	2018	1	-	1	(Waste – Littered - Exported) by polymer . Littering by polymer determined through littering by sector + plastics EU correspondence matrix	1	Properly disposed	1,7
This study - Polymer | Remaining after recycling = Waste + Import of Waste - Export of waste - Recycled of imported - Recycling of domestic	2,0								
PlasticsEurope, 2018 | Sector to polymer mapping based on EU market	1								
This study - Sector | Improperly disposed by sector	1	2018	1	-	1	No improper management of waste (no unsanitary landfill nor dumpsites)	1	Improperly disposed	1,3
This study - Polymer | Remaining after recycling and properly managed	1,9								
This study - Polymer | Waste - Export of waste - Domestic recycling - Properly disposed - Improperly disposed	1,8	2018	1	-	1	Uncollected = Waste - Export of waste - Domestic recycling - Properly disposed - Improperly disposed	1	Uncollected	1,8
This Study - Sector | Leakage by sector	2,13	2018	1	-	1,0	See Polymer flowchart	1	Leaked	1,6
This Study - Polymer | Mismanaged waste by polymer	1,6								



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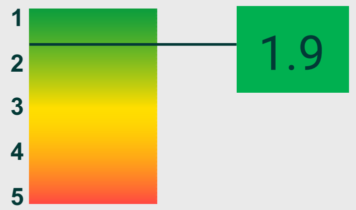


* Data as reported by Cyprus to UN
*** "Recycling of imported waste" together with "recycling of domestic waste" constitute the country's "recycling" bar

APPLICATION HOTSPOTS
DATA QUALITY ASSESSMENT (1/2)

Raw data – Reliability		Modelling – Temporal		Modelling – Geographic		Modelling – Granularity		Final metric	Score
*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
								Export of products	4
interview: This study – Sector | Waste from Packaging and Tourism sector	2	2018	1	-	1	For packaging applications : See Application flowchart. For other applications see additional notes	5	Production from primary	5
sensitive: This study – Application | Share of import/export by application in Packaging sector	4								

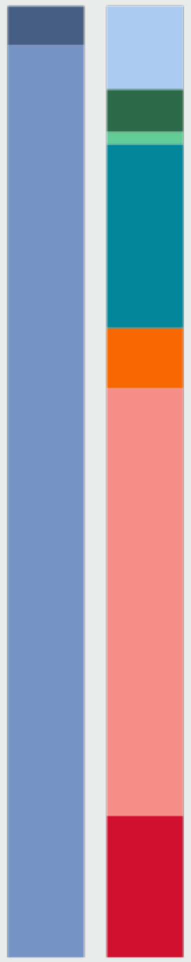
Quality Score

1
2
3
4
5

2.7

APPLICATION HOTSPOTS
DATA QUALITY ASSESSMENT (2/2)

Raw data – Reliability		Modelling – Temporal		Modelling – Geographic		Modelling – Granularity		Final metric	Score
This study - Sector | Plastic in packaging and tourism sector collected for recycling and export of waste	1,63	2018	1	-	1	No recycling. Export of waste for recycling by application proportional to 'waste- littered' , except for plastic bags that we consider are not collected for recycling	2	Export of waste	2
WWF, 2020 | Share of collected for recycling by application	2							Domestic recycling of collected waste***	2
This study - Sector| Properly disposed per Packaging and Tourism sector	2,0	2018 (x3) + 2013	1,67	-	1	For packaging app: Properly managed + Export of waste is proportional to Waste – Littered, the total amount matches the total properly managed by packaging and tourism	2	Properly disposed	2,3
This study - Application | Remaining after recycling = Waste - Export of waste - Recycling of domestic	2,8								
European Commission, 2018 | Plastic packaging application ittering rate in EU	1								
		2018	1		1	No improperly managed	1	Imporperly disposed	0,8
This study - Application | Waste - Export of waste - Domestic recycling - Properly disposed - Improperly disposed	2,3	2018	1	-	1	Uncollected = Waste - Export of waste - Domestic recycling - Properly disposed - Improperly disposed	1	Uncollected	2,3
This Study - Sector | Leakage from Packaging and Tourism sector	2,13	2018	1	-	1,0	See Polymer flowchart	1	Leaked	1,6
This Study - Application | Mismanaged	1,5								



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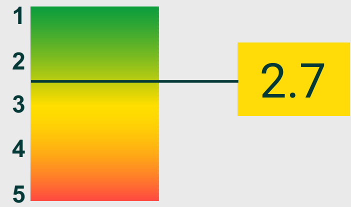


* Data as reported by Cyprus to UN

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

APPLICATION HOTSPOTS MODELLING NOTES

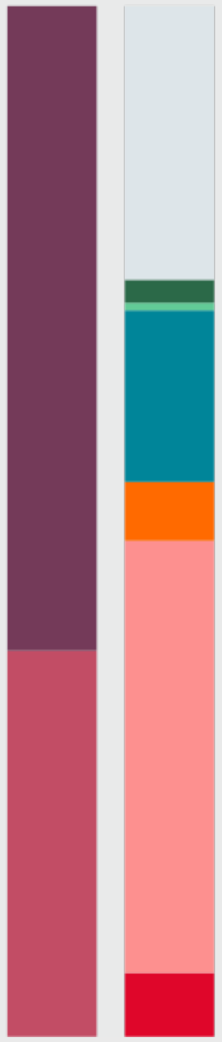
Cigarette filters: We estimate the number of cigarette filters from cigarette consumption data of the Tobacco Atlas project (Kostova et al, 2014) combined with population data of Cyprus. The plastic weight of a cigarette filter is 0.17gr. From these data we obtain the waste generated. Trade data on import 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 ICF, Eunomia EU littering report. The improperly managed is based on the average share of improperly managed (sector hotspot), applied to cigarette filters not littered or properly managed. The leakage rate is taken from PLP (25%) and applied to uncollected and improperly managed to determine de total leakage.

Sanitary towels: import and export are determined through UN 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 2gr. Recycling is set to zero. The share of properly disposed is taken from the average share of properly disposed (sector hotspot), applied to the sanitary towels that are not littered. Littering rate is set to 21%, based on European Commission littering report (2018). The improperly disposed is based on the average share of improperly disposed (sector hotspot), applied to sanitary towels not littered or properly disposed. The leakage rate is taken from PLP (15%) and applied to uncollected and improperly disposed to determine de total leakage.

Baby diapers: import and export are determined through UN COMTRADE (2020). To determine de waste generation we consider the population of children between 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 disposed is taken from the average share of properly disposed (sector hotspot), applied to the baby towels that are not littered. Littering rate is set to 21% (using sanitary towels as a proxy), based on the European Commission littering report (2018) The improperly disposed is based on the average share of improperly disposed (sector hotspot), applied to baby diapers not littered or properly disposed. The leakage rate is taken from PLP (15%) and applied to uncollected and improperly disposed to determine de total leakage.

SECTOR HOTSPOTS
DATA QUALITY ASSESSMENT (1/2)

Raw data		Modelling						Final metric	Score
Reliability		Temporal		Geographic		Granularity			
PlasticsEurope, 2018 | Polymer to Sector mapping based on EU market	1	2018 2017 2018	1	Allocation of sector shares based on typical share of polymer by sectors in Europe;	1,0	For net input quantity see Sector Hotspot flowchart for all sector except for fishing, medical and tourism. Tourism net input is removed from packaging, fishing and medical net input are removed from "Other" sector. To determine long and short lifetime from net input, see Sector hotspot flowchart.	2	Short-lived products	2
Geyer et al., 2017 | Product lifetime by sector, mean and std.	1							Long-lived products	2
This study – Polymer | Net input by polymer*	1,9								
The World Bank, 2012 | Manufacturing, added value, GDP growth	1	2018 2017 2018	1	-	1	See Sector hotspot flowchart. For medical, tourism and fishing we assume no change in stock. Low score because we assume the relative importance of every sector unchanged throughout the year in order to determine the stock	2	Change in stock	2
Geyer et al., 2017 | Product lifetime by sector, mean and standard dev.	1								
This study – Sector | Net input* by sector	2								



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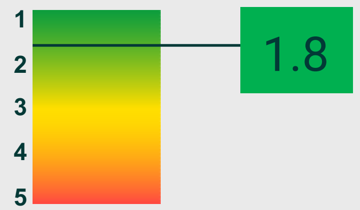
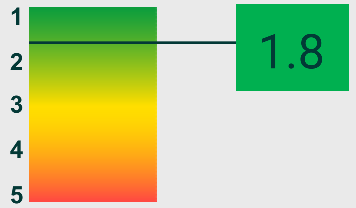


SECTOR HOTSPOTS
DATA QUALITY ASSESSMENT (2/2)

Raw data – Reliability		Modelling – Temporal		Modelling – Geographic		Modelling – Granularity		Final metric	Score
This Study - Polymer | Export of waste and domestic recycling of collected by polymer	1	2018	1	-	1,0	No domestic recycling	1	Export of waste	1,63
PlasticsEurope, 2018 | Polymer to sector mapping based on EU market	2							Domestic recycling of collected waste***	1,63
This study - Polymer | Net input**	1,9								
Statistical Service of Cyprus, 2019 | Total plastic collected for recycling	1	2018 (6x) + 2013	1,3	Country specific littering habits are not accounted for	2	(Waste – Littered – Micro-Leaked) by polymer / tot (Waste – Littered – Micro-leaked) * (tot export for recycling + tot properly managed) – export for recycling	1	Properly disposed	2,0
This study - Regional | Total plastic being properly disposed	2								
This study - Sector | Non recycled waste = Waste - Export of Waste - Recycled	1,8								
Plastic Leak Project, 2019 | Littering rate by Sector (based on product size and type of usage)	3								
This Study - Sector | Micro-leakage by sector (see additional notes)	2								
This study - Sector | Waste	2								
		2018	1	-	1	No improperly managed waste	1	Improperly disposed	1
This study - Polymer | Waste - Export of waste - Domestic recycling - Properly disposed - Improperly disposed	1,79	2018	1	-	1	Uncollected = Waste - Export of waste - Domestic recycling - Properly disposed - Improperly disposed	1	Uncollected	1,79
Plastic Leak Project, 2019 | Release Rate by sector (base on product size and value for informal recyclers)	3	2018	1	-	1	For Micro-leakage computation see additional notes, for Macro-leakage see sector hotspot flowchart, except for fishing (see additional notes)	2	Leakage	2,1
This Study - Geographical | Total Macro-leakage	2								
This Study - Sector | Mismanaged	1,4								

Quality Score



** 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

SECTOR HOTSPOTS MODELLING NOTES

Medical: Total plastic waste generated by the medical sector is computed by combining the number of hospital beds (WHO statistics 2010, 38,3 beds per 10'000 inhabitants), the default average bed occupancy rate (80%), the total waste generated by bed and the average plastic share in medical waste (set at 4 kg/bed/day and 20% respectively). No distinction was made infectious and non-infectious medical waste.

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 Cyprus citizen.

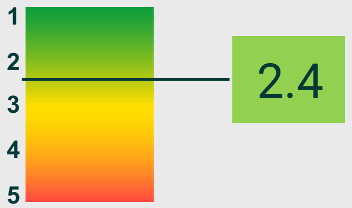
Micro-leakage contribution

- **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 (2020). The number of cars was taken from Transport Statistics 2016 (Statistical Service, 2018) and the average distance by car for EU was used (ODYSEE-MURE, 2020)
- **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 (2020)
- **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 (2020)
- **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)

Raw data: Reliability		Modelling: Temporal		Modelling: Geographic		Modelling: Granularity		Final metric	Score
This Study - Regional | Waste collected by Region = Properly managed + Improperly managed + Collected for recycling	2	2018	1	See additional notes	3	-	1	Waste generated	3
WTO, 2018 | Average stay by number of days and total number of tourists	1								
This Study - Sector | Total plastic waste generated	2								
CIESIN, 2018 | NASA population count on 1km2 grid	1,5								
KPMG, 2019 | Number of hotel beds per regions	1								
Jamback, 2015 | Littering rate	3								
Republic of Cyprus, 2018 | Total plastic collected for recycling (2017)	2	2017 2013	2	Waste collected for recycling by region as of 2013 is known. Total waste collected for recycling in 2017 is known. Extrapolation to 2018 by region: collected by region 2018 = collected by region in 2013/ tot collected 2013 * tot collected 2018. We assume the recycled textile does not contain plastic.	2	-	1	Collected for recycling	2
Ministry of Agriculture, 2015 | Plastic waste separated for recycling by region (2013) (Table IV-3.4 for Paphos, Table IV-3.12 3.16 3.17 for Larnaca-Famagusta, Table IV-3.21 for Nicosia, Table IV-3.24 for Limassol)	1								
Ministry of Agriculture, 2015 | Share by region of the total waste collected in the country (Figure IV-3.1)	1	2013 2013 2013 2018	3	No improper disposal of waste. For properly disposed see additional notes.	2	See additional notes	2	Properly disposed	3
Ministry of Agriculture, 2015 | Share of plastic in waste stream for Nicosia (Table IV-3.22) and Limassol (Table IV-3.30)	1							Improperly disposed	1
Ministry of Agriculture, 2015 | Plastic disposed to landfill for Larnaca-Famagusta (Table IV-3.12) and Paphos (Table IV-3.3)	1								
This study - Regional | Plastic waste collected for recycling by region	2								
This study - Regional | Waste - Collected for recycling - Properly disposed - Improperly disposed (by province)	2,3	2018	1	-	1	Uncollected = Waste - Collected for recycling - Properly disposed - Improperly disposed	1	Uncollected	2

Quality Score



REGIONAL HOTSPOTS
DATA QUALITY ASSESSMENT (2/2)

Raw data	Reliability	Modelling: Temporal		Modelling: Geographic		Modelling: Granularity		Final metric	Score
This Study - Regional | Mismanaged = Uncollected + Improperly managed by province	2	2013-2018	1	-	1	Share of mismanaged by province = Waste mismanaged by province / waste generated by province	1	Share of Mismanaged	2,3
This Study - Regional | Waste generated by province	3								
This study - Regional | Collected = Collected for recycling + Properly disposed + Improperly disposed	2	2013-2018	1	-	1	Share of collected = Waste mismanaged by province / waste generated by province	1	Share of Collected	2
DFRM, 2020 | Number of fishing licenses 2018	1	1990 2015 2019	3	-	4	See additional notes	2,5	Leakage from fishing sector	4
Nédélec et al., 1990 | Drawings of various fishing gear	2								
FAO, 2004 | Number of commercial vessels	2								
FAO, 2015 | Number of gear by artisanal and commercial fishing vessel	2								
Richardson et al., 2019 | Loss rate by fishing gear type	2								
This study - Regional | MWI by province	2,3	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
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	2								
Jambeck et al., 2015 | Central estimate for maximum release rate	2								

Quality Score

1
2
3
4
5

2.4

*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)

REGIONAL HOTSPOTS MODELLING NOTES

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.

To know how many fishing gear by type are used in Cyprus in 2018, the number of licenses by type provided in DFRM 2020 with the maximum gear length or number of hooks allowed has been used. By default, we use the maximum gear length or number of hooks to estimate the number of fishing gears in use.

(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.

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CYPRUS
Country report

Published in December 2020,
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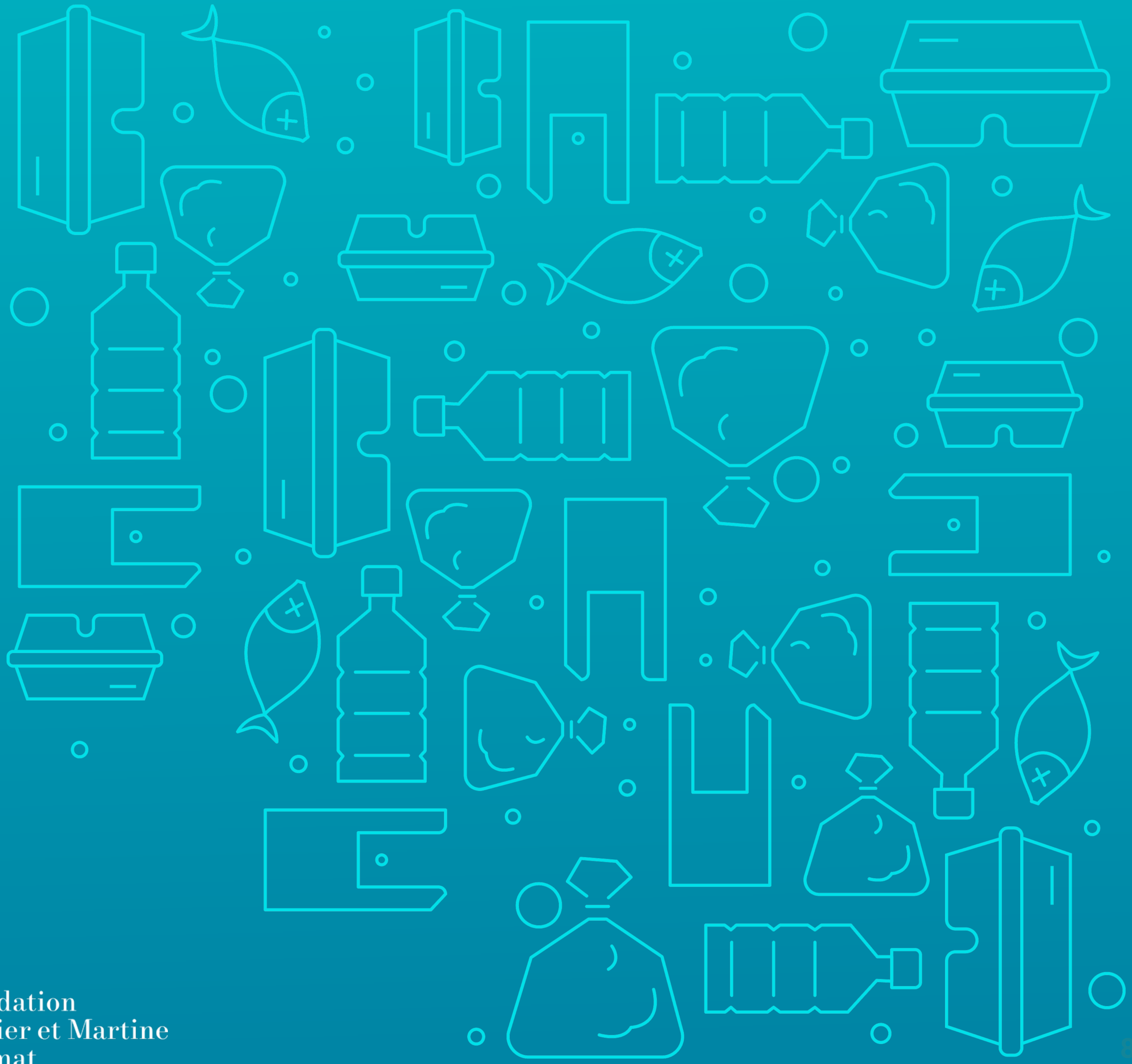

Implemented with ea + Quantis

Funded by the Didier et Martine Primat Foundation

Fondation Didier et Martine Primat