IUCN

UN environment programme

Life Cycle Initiative

NATIONAL GUIDANCE FOR PLASTIC POLLUTION HOTSPOTTING AND SHAPING ACTION

FINAL REPORT FOR MENORCA

December 2020

Implemented with ea + Quantis

Funded by the Didier et Martine Primat Foundation

Fondation Didier et Martine Primat

AUTHORSHIP

Report published in December 2020, with results for year 2018

Technical lead

Dr. Paola Paruta, EA
Alexandre Bouchet, EA
Dr. Margherita Pucino, EA
Dr. Julien Boucher, EA

Quantis

Laura Peano, Quantis
Violaine Magaud, Quantis

Implementing lead

Alessia Iovinelli, IUCN
Mercedes Muñoz Cañas, IUCN
Marie-Aude Sévin-Allouet
Lynn Sorrentino, IUCN
Dr. Janaka da Silva, IUCN

Methodological support

UN environment programme

Dr. Feng Wang, UNEP
Ran Xie, UNEP

Reviewers

Alessia Iovinelli, IUCN
Mercedes Muñoz Cañas, IUCN
Dr. Feng Wang, UNEP
Ran Xie, UNEP

Design

ORO. Social Impact Design

Martha Perea Palacios, ORO

To be cited as:

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

ABOUT

IUCN is a membership Union uniquely composed of both government and civil society organisations. It provides public, private and non-governmental organisations with the knowledge and tools that enable human progress, economic development and nature conservation to take place together. Created in 1948, IUCN is now the world's largest and most diverse environmental network, harnessing the knowledge, resources and reach of 1,400 Member organisations and some 15,000 experts. It is a leading provider of conservation data, assessments and analysis. Its broad membership enables IUCN to fill the role of incubator and trusted repository of best practices, tools and international standards. IUCN provides a neutral space in which diverse stakeholders including governments, NGOs, scientists, businesses, local communities, indigenous peoples' organisations and others can work together to forge and implement solutions to environmental challenges and achieve sustainable development. Working with many partners and supporters, IUCN implements a large and diverse portfolio of conservation projects worldwide. Combining the latest science with the traditional knowledge of local communities, these projects work to reverse habitat loss, restore ecosystems and improve people's well-being.

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 Socio-environmental Observatory of Menorca (OBSAM) for their strategic guidance and support in ensuring that national activities and engagements were executed in a smooth manner. Special thanks to Joana Mendes and Eva Marsinyach for their support and providing data for this study.

The PWFI Med team would also like to thank the Department of Environment, the Menorca Biosphere Reserve Agency, and the Consortium of Waste and Energy of the Menorca Island Council (CIM), the General Directorate of Waste and Environmental Education and the Agency of Tourism Strategy of the Government of the Balearic Islands (GOIB), the Menorca Preservation Fund, the Balearic Group of Ornithology and Defence of Nature (GOB Menorca), the World Network of Island and Coastal Biosphere Reserves (ZERO Plastic Group), the LEADER-GALP- Local Fisheries Action Group of Menorca, the “Per la mar viva” group, the Marilles Foundation, and the Save the Med Foundation, 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 Menorca

90% Collection rate

10% Mismanaged

14% Collection for recycling

0% Domestic recycling rate

78 t Leakage

0.8 Kg Per capita leakage

Hotspots

Most critical polymers

- PET
- LDPE
- PP
- Synthetic rubber
- HDPE
- Polyester
- 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

Alaior and Mahón Municipalities responsible for 56% of the plastic leakage

Shaping action from the hotspots

8 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
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

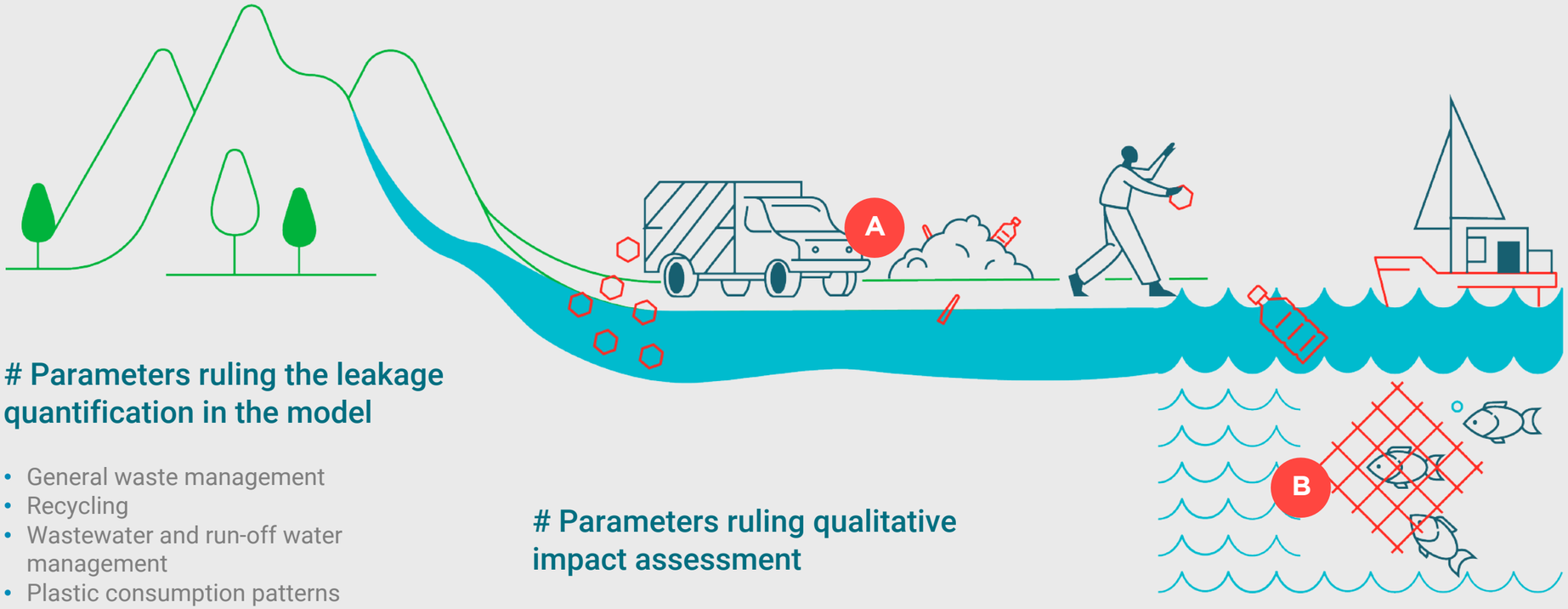
Informal sector: Individuals or a group of individuals who are involved in waste management activities, but are not formally registered or formally responsible for providing waste management services. Newly established formalized organizations of such individuals; for example, cooperatives, social enterprises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

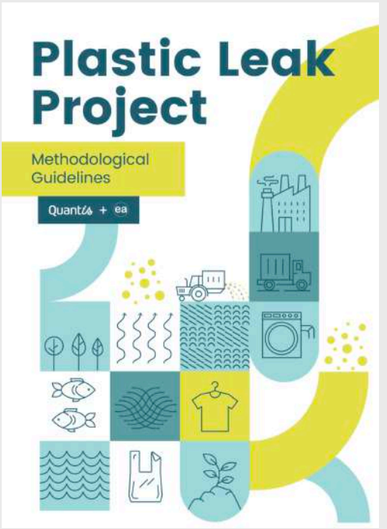


Parameters ruling the leakage quantification in the model

- 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

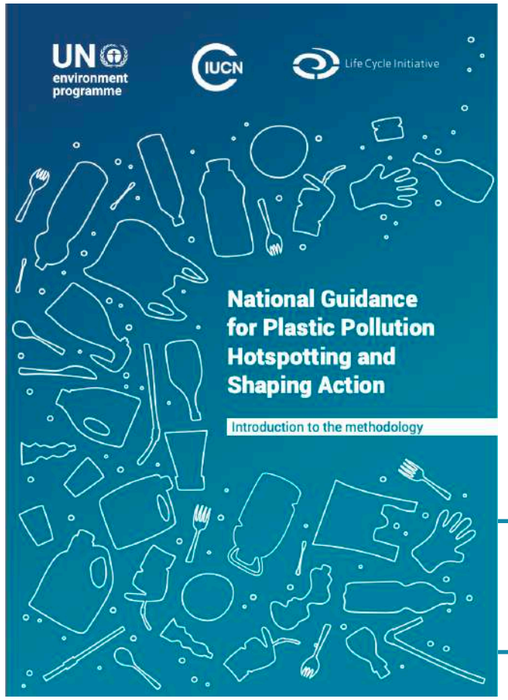
1 INTRODUCTION TO THE GUIDANCE

National guidance for plastic pollution hotspotting and shaping action

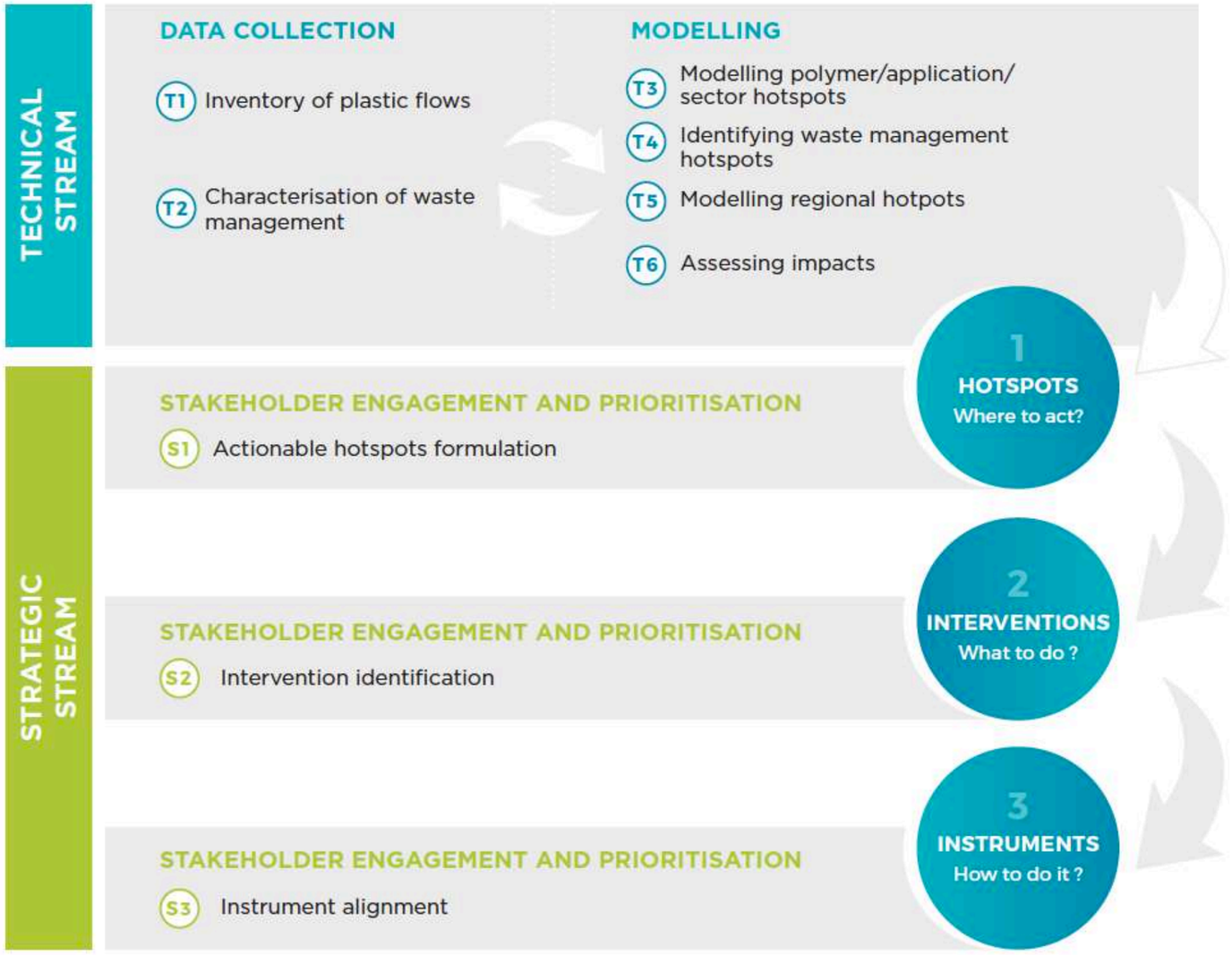
SCHEMATIC OF THE GUIDANCE

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 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

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.

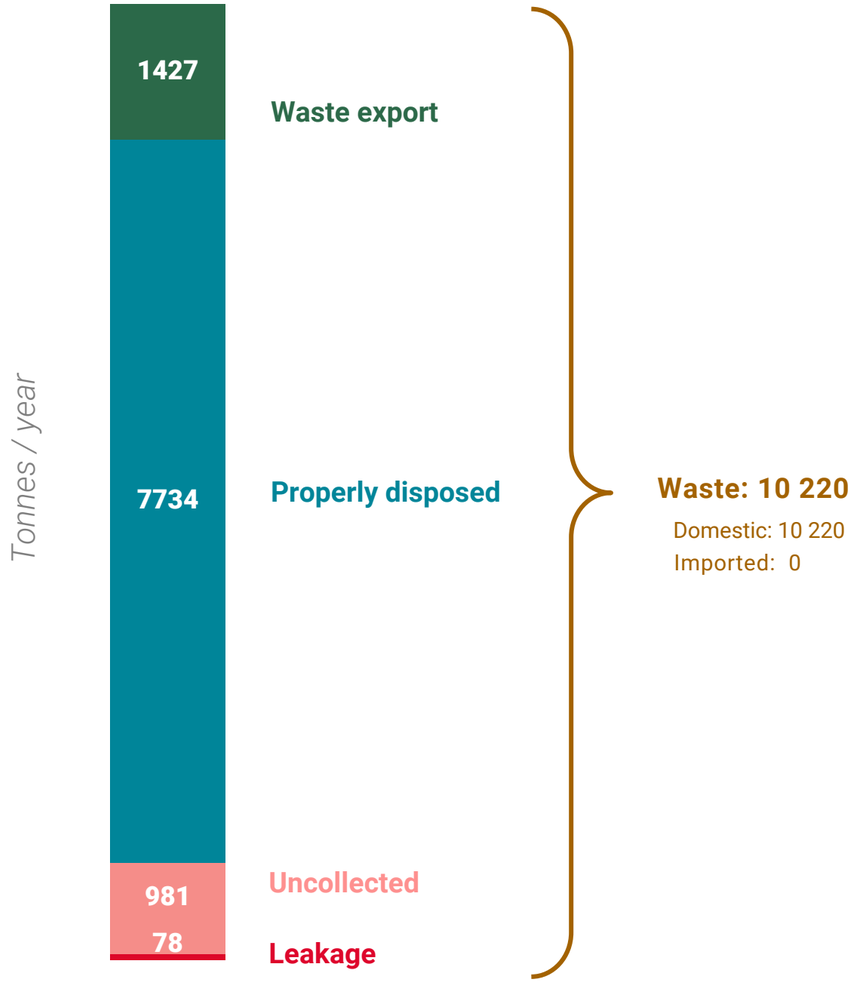
Additional information on the methodology and modelling process can be found directly in the **modules and tools** associated with the guidance and highlighted by this icon.

2 PLASTIC POLLUTION HOTSPOTS

2.1 COUNTRY OVERVIEW

COUNTRY PLASTIC MATERIAL FLOW [2018]

Summary of the results for all plastics in the country

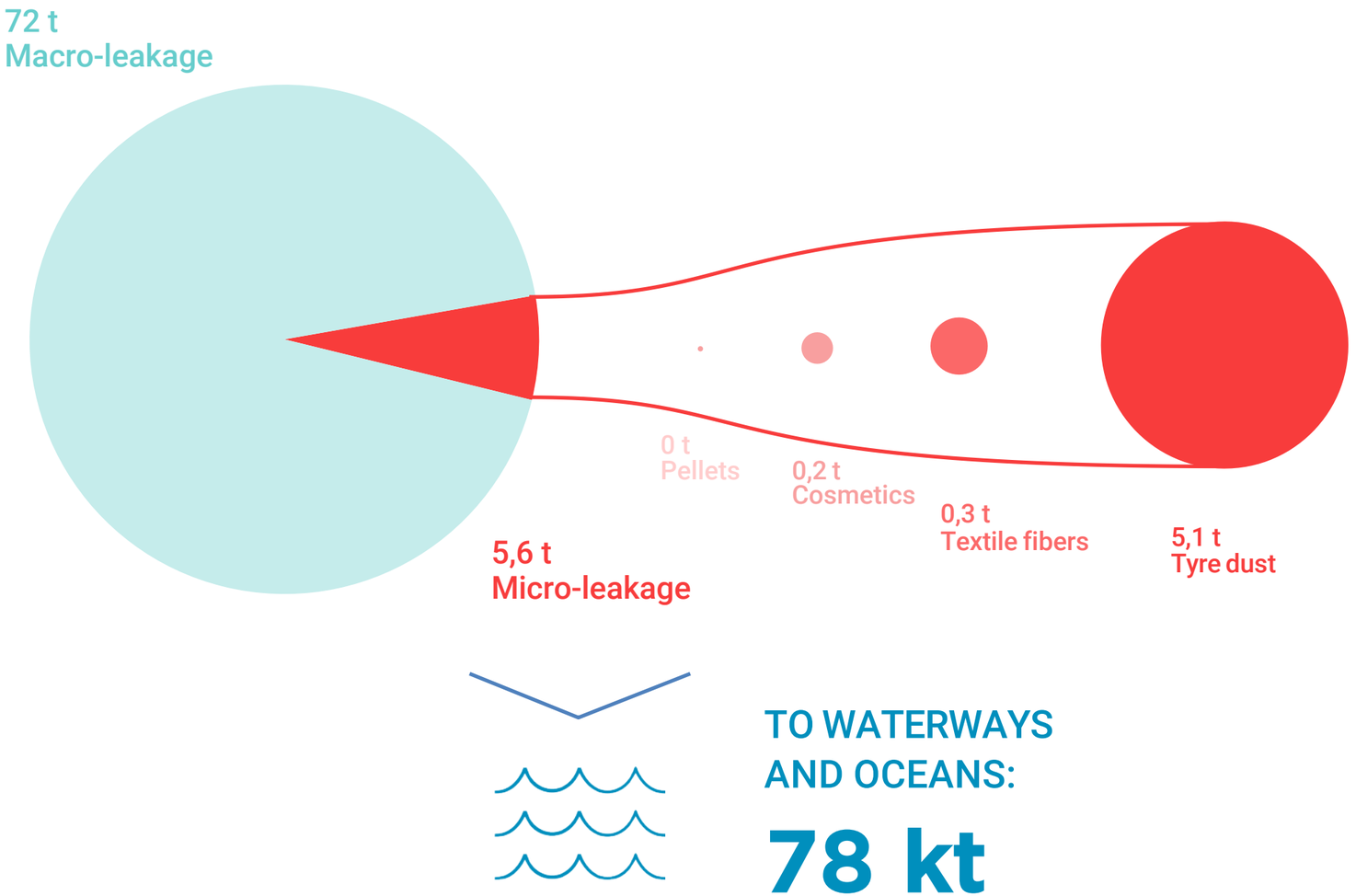


Key take-aways

- **10 220 tonnes** of plastic waste generated in Menorca in 2018, from which 2476 tonnes (24%) are attributed to the tourism sector. Plastic waste generation per capita amounts to **111 kg/cap/year** (including tourists on annual basis).
- **90%** collection rate on average.
- No recycling facilities in Menorca. Around **14%** of plastic waste is exported for recycling.
- **7734 tonnes** of plastic waste are landfilled (assuming no incineration facility is in place).
- **10%** of plastic waste is mismanaged in Menorca (either littered or uncollected).
- **78 tonnes** of plastic leak into waterways from Menorca in 2018, including 19 t (24%) attributed to the tourism sector. This corresponds to a **1%** leakage rate and **0,8 kg/cap/year** leakage per capita.

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.

MACRO-LEAKAGE VS MICRO-LEAKAGE [2018]



Key take-aways

- **Micro-leakage contributes for 7% of the overall country leakage.** This is mainly driven by tyre dust from abrasion during road transportation.

Limitations

To estimate tyre abrasion, we used the average distance travelled by car in Spain (ODYSSEE-MURE, 2020) divided by two (as mobility on the island is assumed to be reduced compared to a mainland country). We assumed that trucks are covering the same average distance as cars.

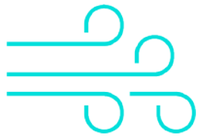
More details available in Appendices

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

OPEN BURNING: A ROUGH ESTIMATE [2018]

1059 t
Total plastic mismanaged

60%
Potentially released into the air as noxious chemical substances through open burning



POLLUTION TO THE AIR:
635 t

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 Menorca, 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

WHAT

WHAT

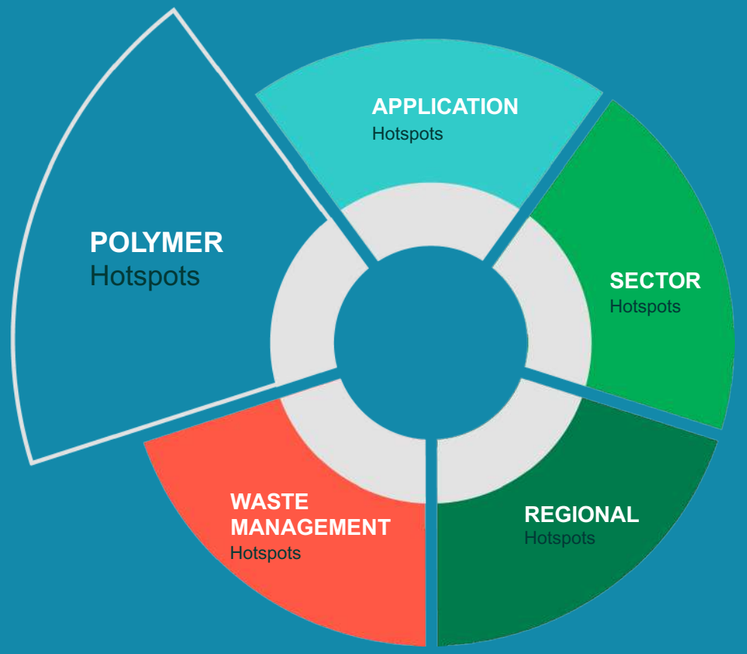
WHERE

WHERE

WHY

ACTIONABLE HOTSPOTS FORMULATION

A POLYMER HOTSPOTS

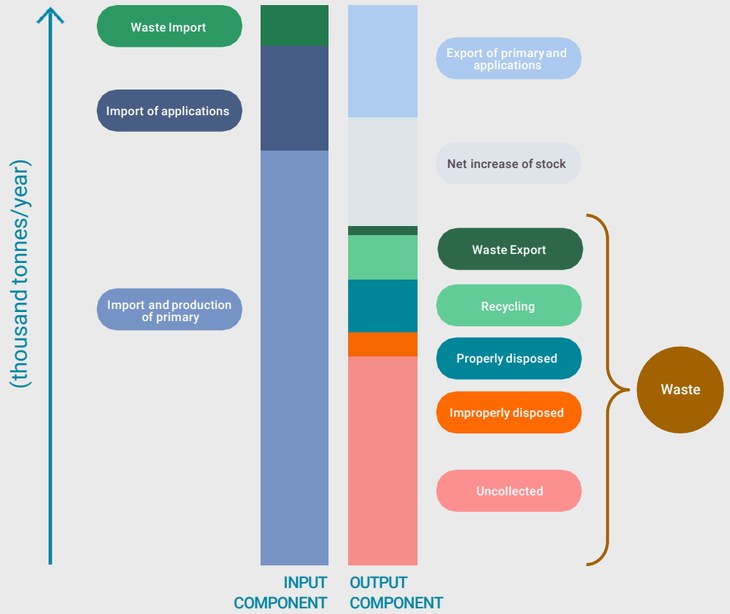


OBJECTIVE AND INSTRUCTIONS

Key question answered:

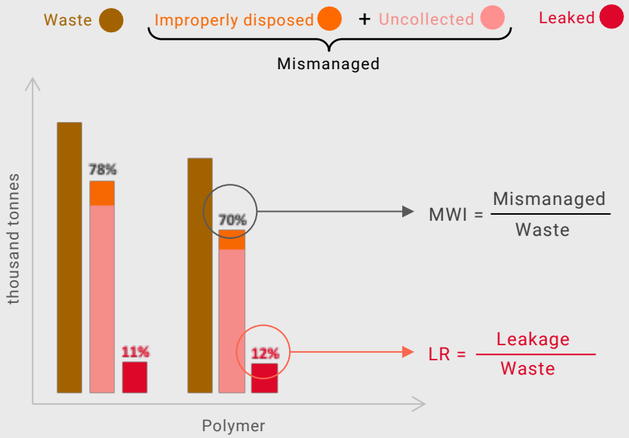
Which polymers are most critical in the country regarding plastic leakage?

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

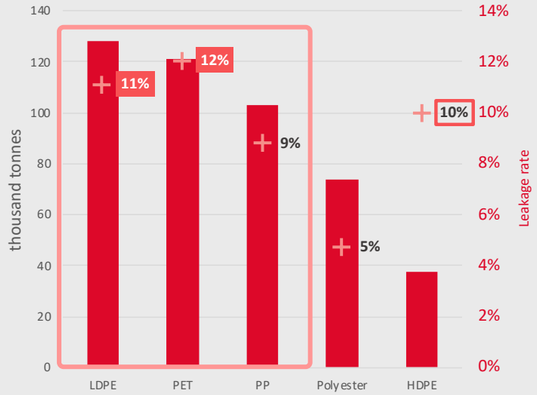


How to read the polymer hotspot graph?

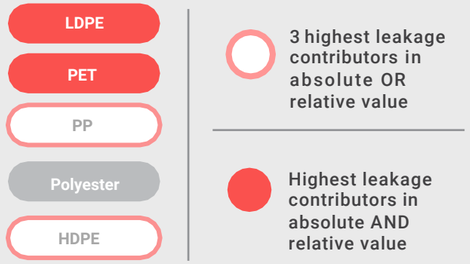
1. Determine leakage from mismanaged waste



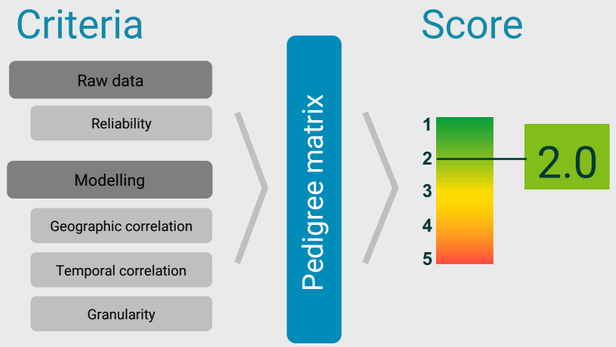
2. Focus on leakage and leakage rate



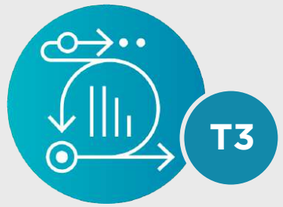
3. Select hotspots based on absolute and relative leakage



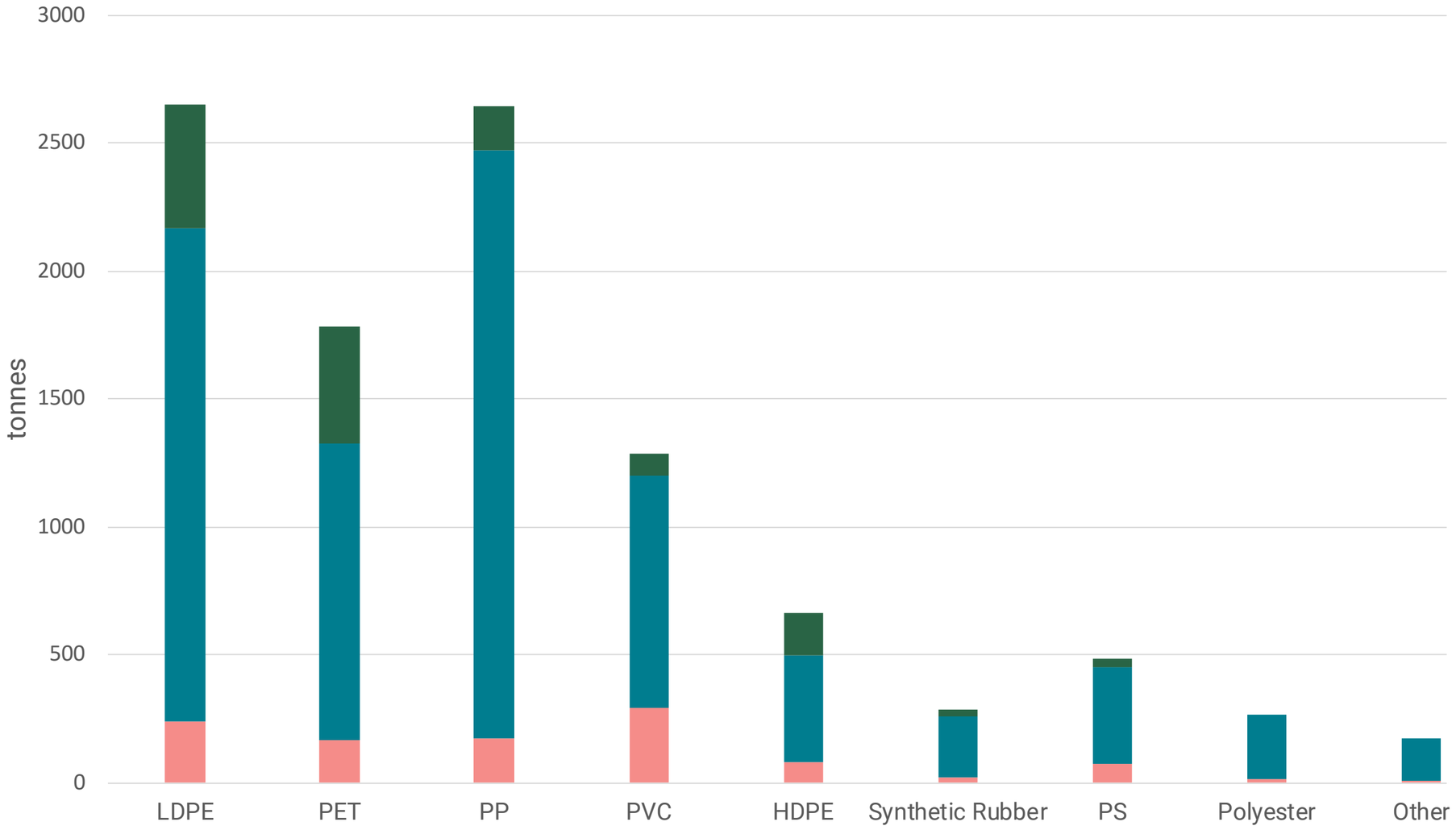
4. Assess the quality score of the results



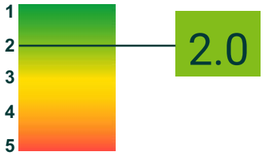
For more details, please read the Methodology



MASS BALANCE BY POLYMER [2018]



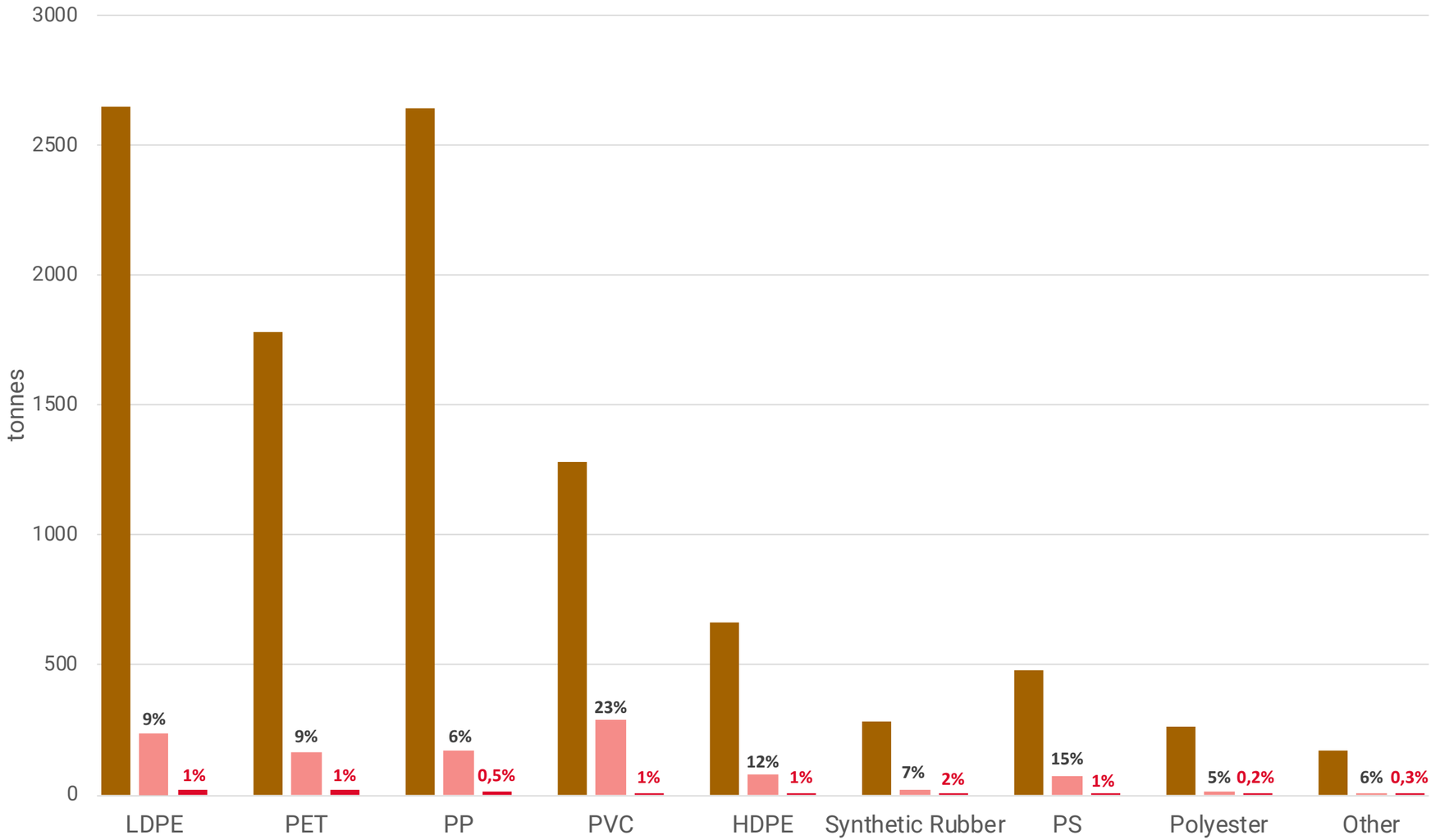
Quality Score



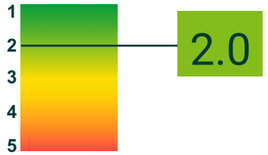
LEGEND

- Waste Export
- Recycling
- Properly managed
- Uncollected

MISMANAGED WASTE AND LEAKAGE BY POLYMER [2018]



Quality Score



Domestic waste

Improperly disposed
+
Uncollected

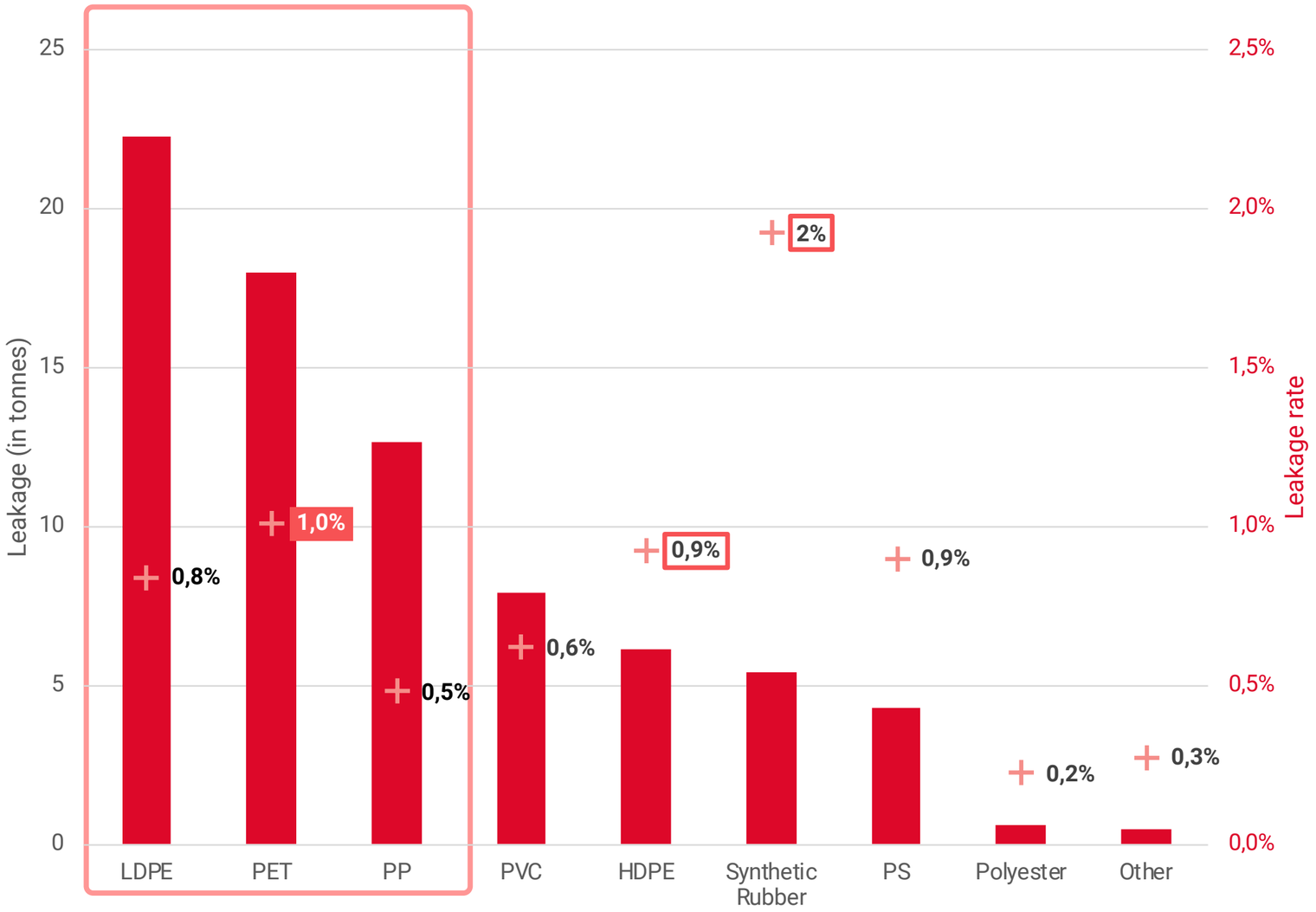
Mismanaged

Leaked

X% | Mismanaged Waste Index (MWI)

X% | Leakage Rate (LR)

POLYMER HOTSPOTS [2018]



PET

LDPE

PP

Synthetic Rubber

HDPE

Polyester

PS

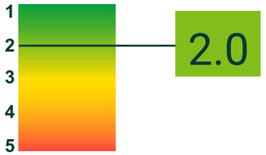
PVC

Other

3 highest leakage contributors in absolute OR relative value

Highest leakage contributors in absolute AND relative value

Quality Score



Key take-aways:

- **LDPE** is the top contributor in absolute leakage (22 t), with a leakage rate of 1%.
- **PET** and **PP** follow with 18 t and 13 t of leakage respectively, with a leakage rate of 1% and 0.5% respectively.
- Although **Synthetic Rubber** ranks low in absolute leakage (5 t), 2% of its generated waste leaks into the oceans and waterways, especially due to microleakage from tyre abrasion.

POLYMER HOTSPOTS:
INTERPRETATION AND LIMITATIONS

LDPE

Learnings

LDPE is the top polymer by absolute leakage. Together with PP it is the polymer with the highest waste generation. LDPE is mostly used in the packaging sector, and packaging items tend to have higher chances of being littered and get release to the sea.

PET

Learnings

PET is identified as a main hotspot both by absolute and by relative leakage. PET is the third polymer by waste generation and 26% of PET is exported for recycling. Nonetheless, because PET is almost exclusively used in packaging and packaging on-the-go items have higher chances of leaking to the environment, there are still 18 tonnes of PET leaking to the sea.

PP

Learnings

PP is the third polymer by absolute leakage, and the first polymer by total leakage.

Synthetic Rubber

Learnings

Synthetic Rubber is the polymer with the highest leakage rate at 2%. This is due to the micro-leakage from tyre abrasion which contributes to 95% of the Sythetic Rubber leakage.

Limitations

Of the 283 tonnes of Sythetic Rubber waste estimated to be generated in Menorca in 2018, only 25 tonnes were recorded to be disposed to waste management facilities in Menorca, for recycling. We assumed the remaining non-littered Sythetic Rubber to be still as likely as other waste to be collected, but there is no actual insight on where this waste might be disposed of.

Unlocking limitations

Investigate the fate of Sythetic Rubber which is not collected for recycling.

POLYMER HOTSPOTS:
INTERPRETATION AND LIMITATIONS

All polymers

Learnings

The difference in leakage rate between the different polymers is of the order of 1%, therefore absolute leakage is a better indicator for hotspot selection in the case of Menorca.

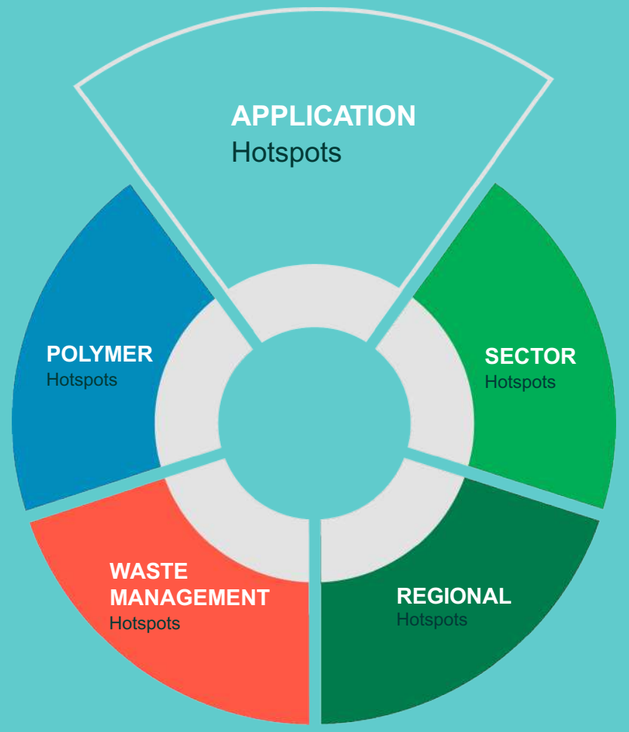
Limitations

Waste generation by polymer was determined by scaling down the waste generation of Spain, the assumption being that the waste generation per capita is the same across Spain and Menorca.

Unlocking limitations

Perform characterisation study of waste generation in Menorca at household level.

B APPLICATION HOTSPOTS

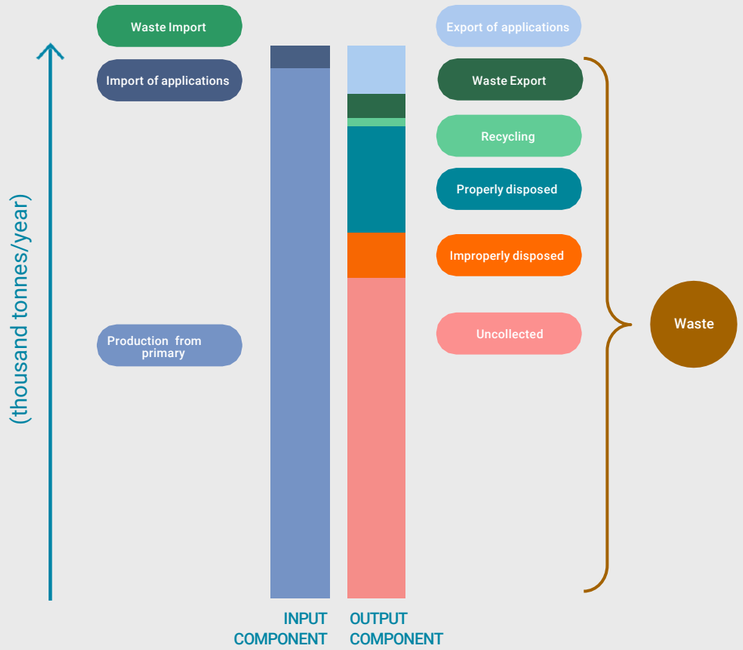


OBJECTIVE AND INSTRUCTIONS

Key question answered:

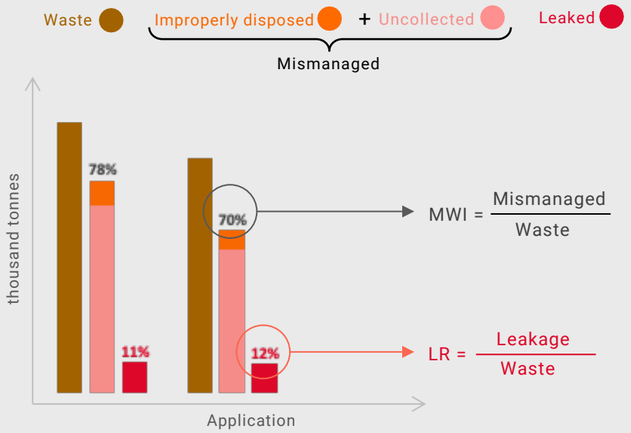
Which applications are most critical in the country regarding plastic leakage?

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

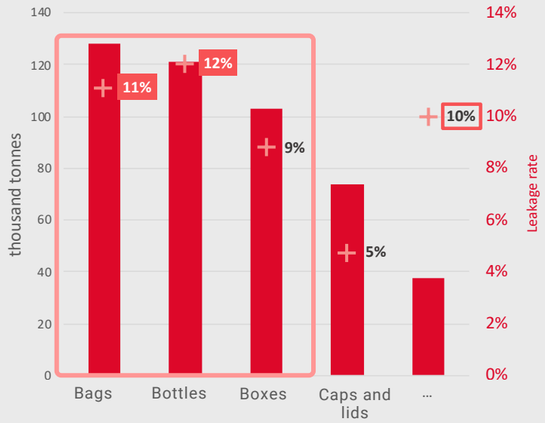


How to read the application hotspot graph?

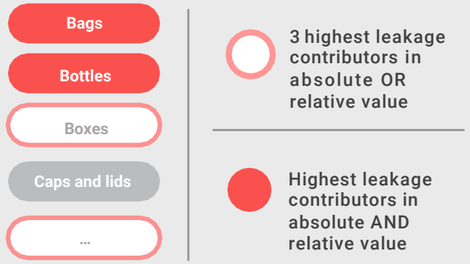
1. Determine leakage from mismanaged waste



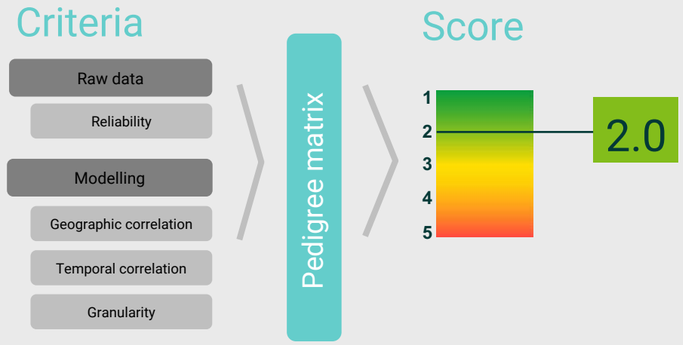
2. Focus on leakage and leakage rate



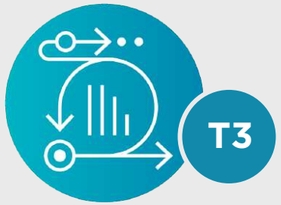
3. Select hotspots based on absolute and relative leakage



4. Assess the quality score of the results



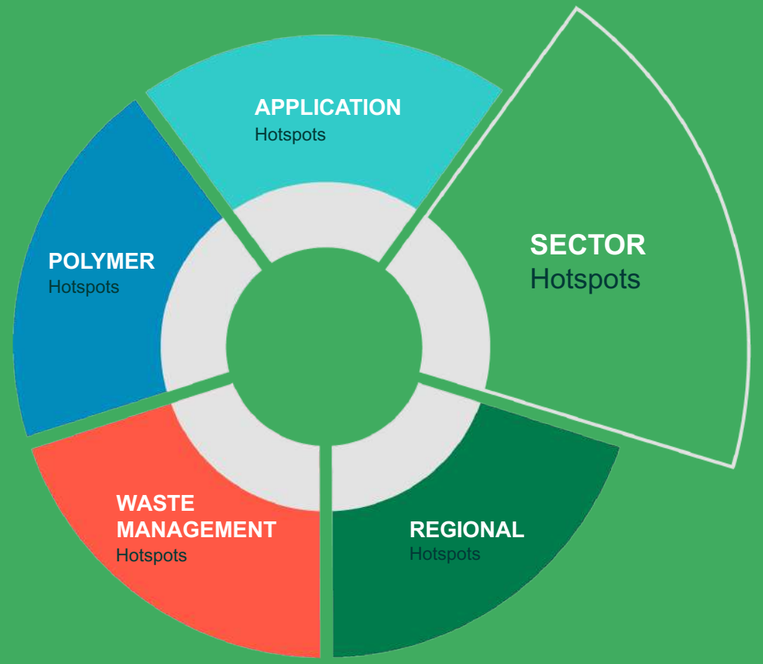
For more details, please read the Methodology



NOT APPLICABLE WITH CURRENT DATA FOR MENORCA

C

SECTOR HOTSPOTS

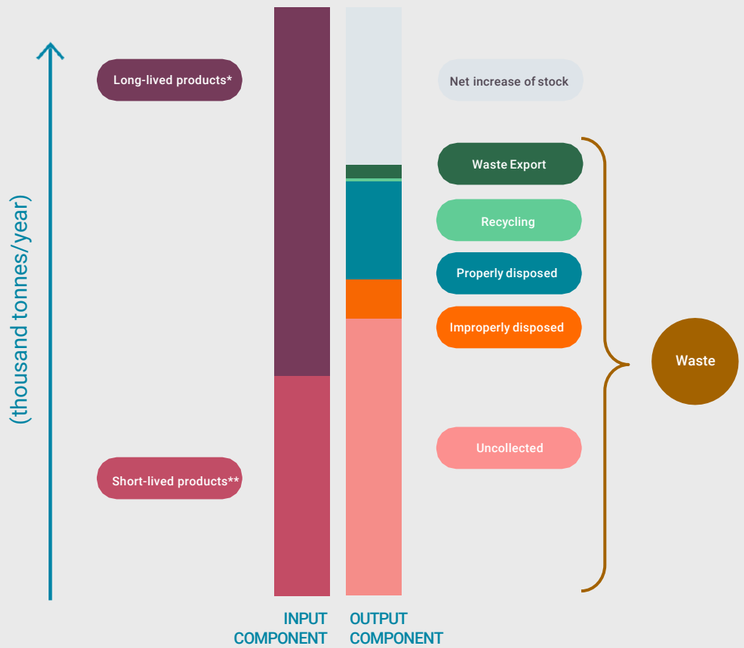


OBJECTIVE AND INSTRUCTIONS

Key question answered:

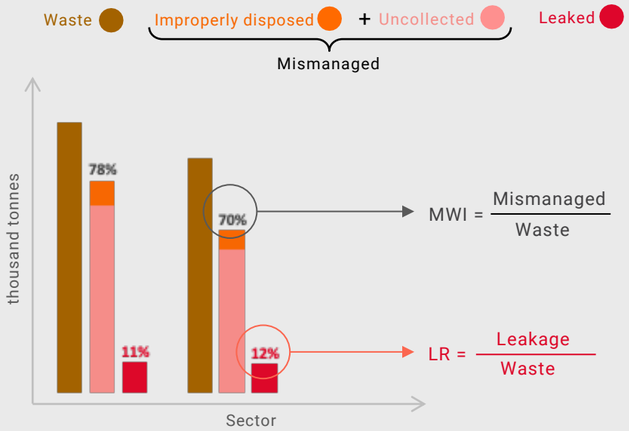
Which sectors are most critical in the country regarding plastic leakage?

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

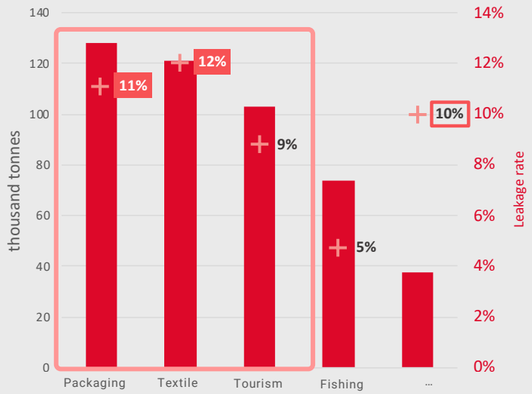


How to read the sector hotspot graph?

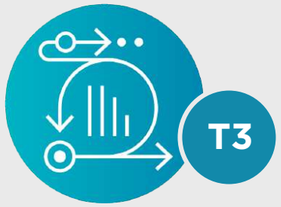
1. Determine leakage from mismanaged waste



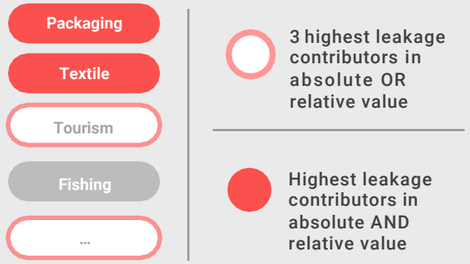
2. Focus on leakage and leakage rate



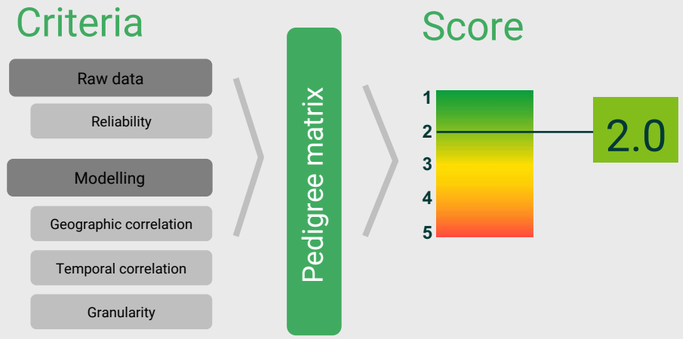
For more details, please read the Methodology



3. Select hotspots based on absolute and relative leakage

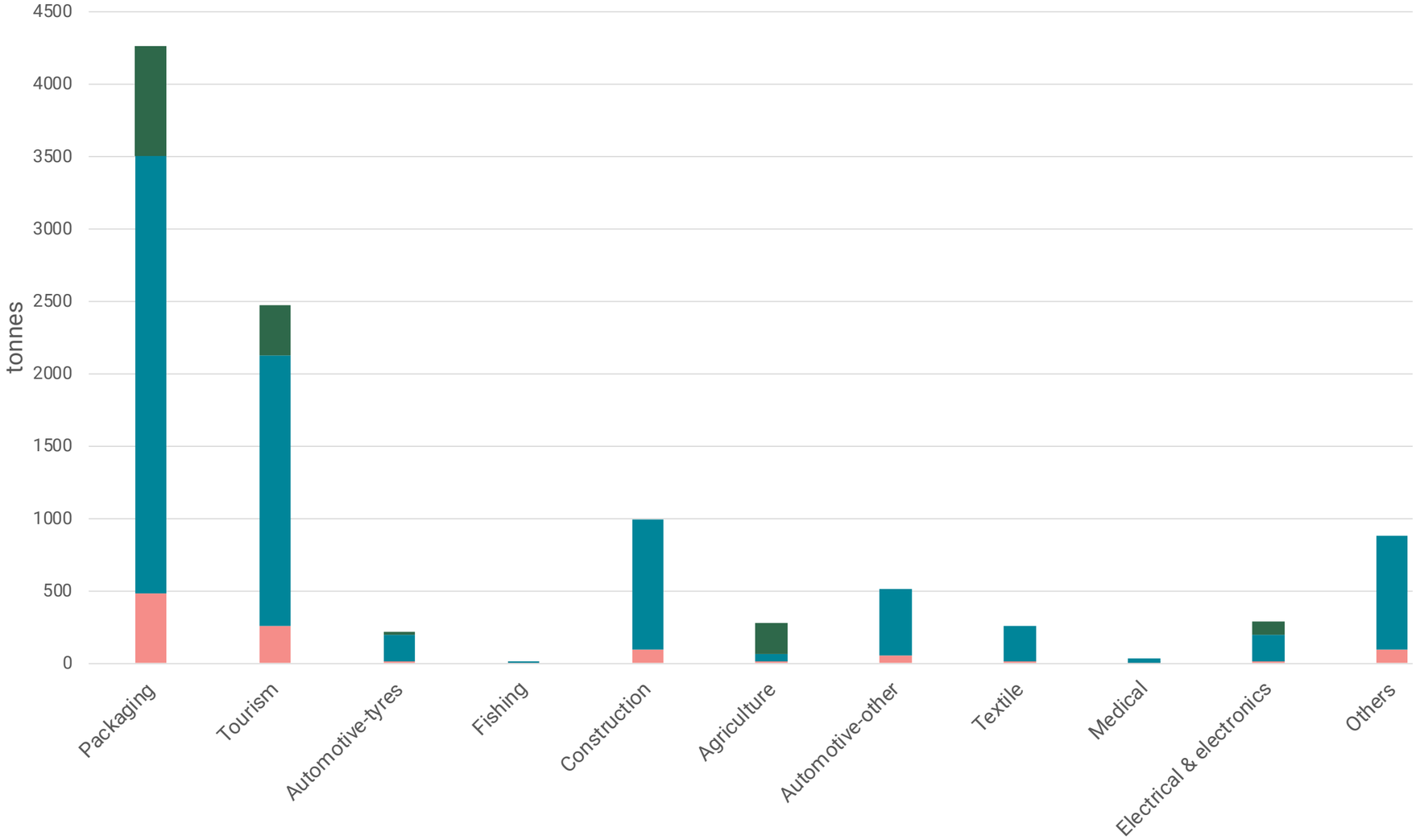


4. Assess the quality score of the results

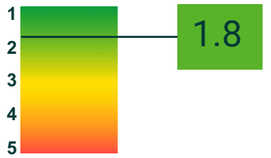


* **Short-lived products**: products that are disposed within the year of study (Life-time < 1 year)
** **Long-lived products**: products that are disposed after the year of study (Life-time > 1 year)

MASS BALANCE BY SECTOR [2018]



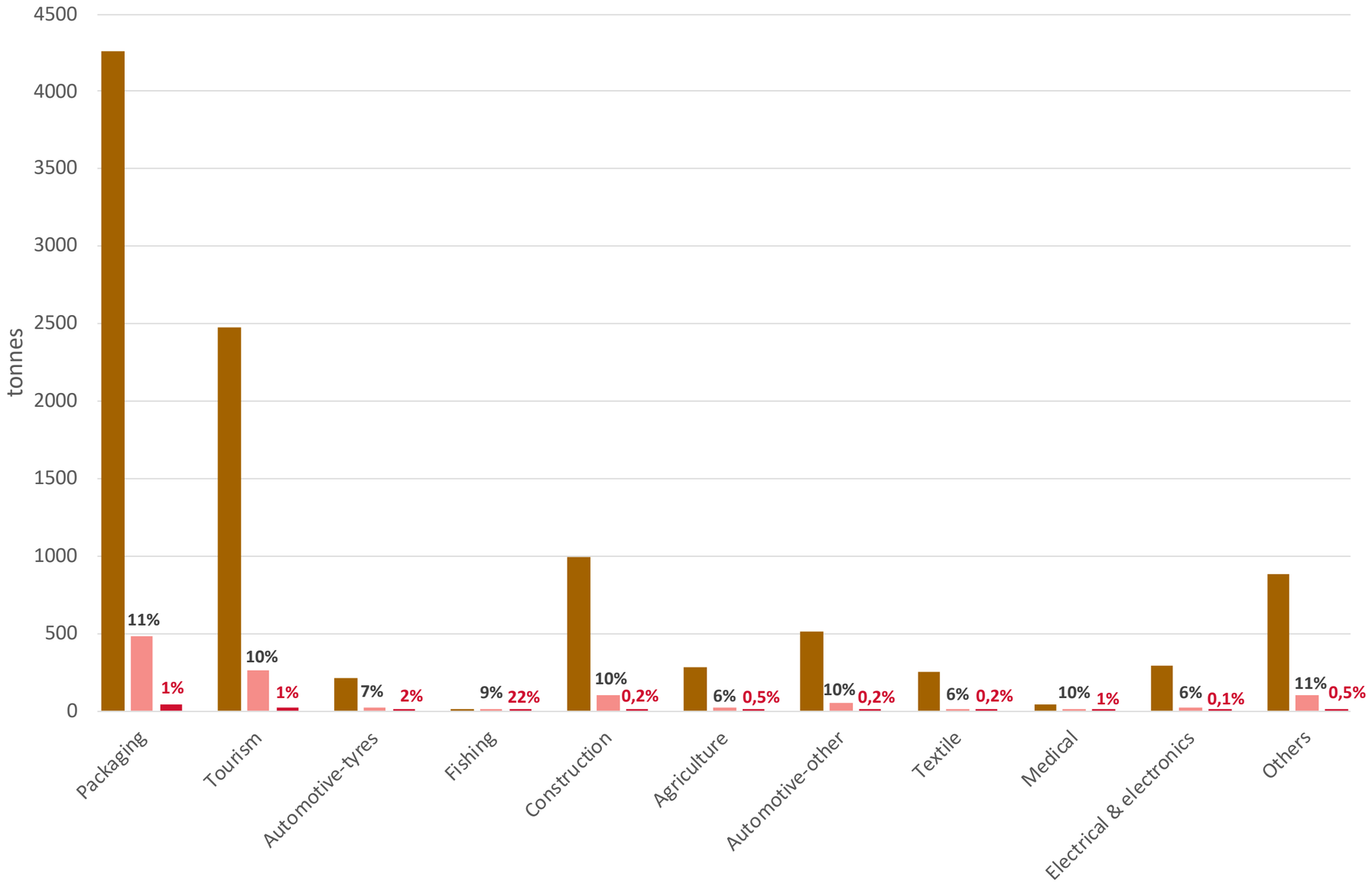
Quality Score



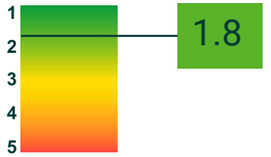
LEGEND

- Waste Export
- Recycling
- Properly managed
- Uncollected

MISMANAGED WASTE AND LEAKAGE BY SECTOR [2018]



Quality Score



Domestic waste

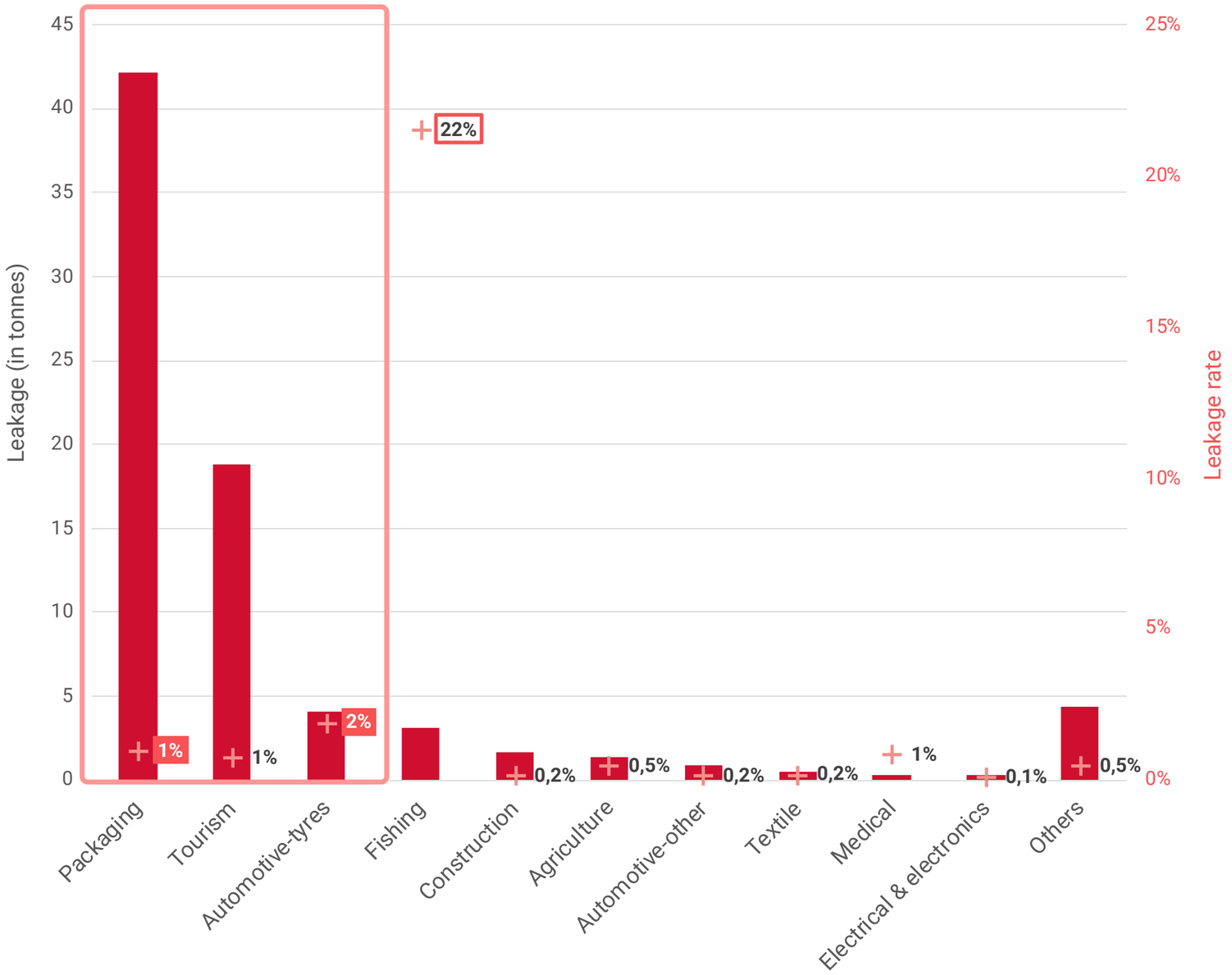
Improperly disposed
+
Uncollected
} Mismanaged

Leaked

X% | Mismanaged Waste Index (MWI)

X% | Leakage Rate (LR)

SECTOR HOTSPOTS [2018]



Packaging

Automotive-tyres

Tourism

Fishing

Medical

Textile

Agriculture

Electrical & electronics

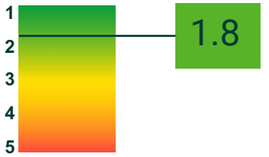
Automotive-other

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 40% of the total plastic leakage with 42 t of packaging waste leaking.
- **The tourism sector** is the 2nd highest contributor to plastic leakage in absolute value (19 t).
- **The automotive-tyre sector** ranks 3rd in absolute leakage (5 t) and 2nd in relative (2%) due almost entirely to microplastic leakage from tyre abrasion.
- **The fishing sector** has the highest leakage rate (22%).

SECTOR HOTSPOTS:
INTERPRETATION AND LIMITATIONS

Tourism

Learnings

The tourism sector makes up for 22% of the waste in Menorca, with almost 2500 tonnes of waste generated for tourist related activities.

Limitations

We assume that tourists have the same daily per capita plastic waste generation as resident population. Therefore, we attribute a share of the waste from all sector to the tourism sector, based on the tourist population. See the appendix for more details.

Unlocking limitations

Studies could be conducted to identify tourists waste generation patterns.

Packaging

Learnings

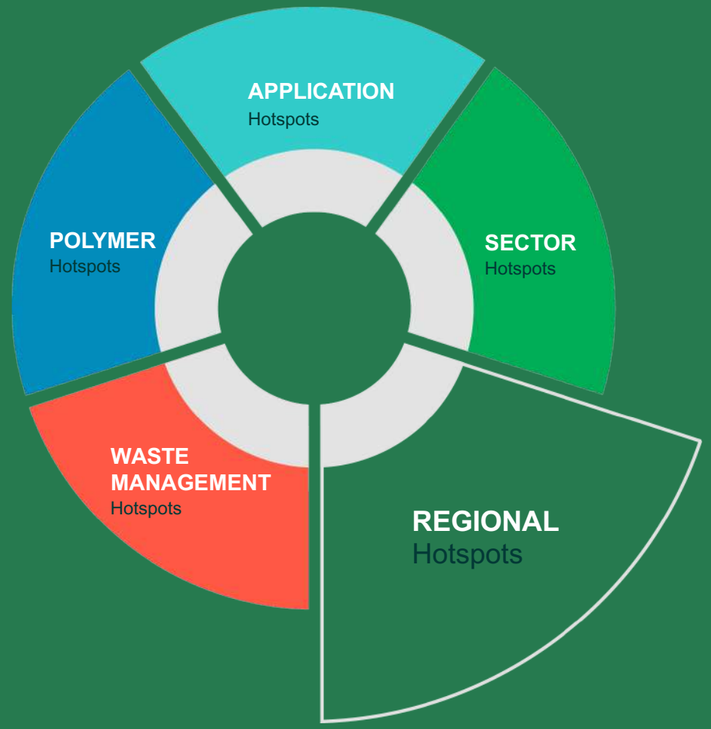
Most of the plastic waste generation in Menorca comes from Packaging sector. 5618 tonnes of plastic waste from packaging were generated in Menorca in 2018 (22% of it has been attributed to the tourism sector). Due to the on-the go nature of packaging products, plastic from packaging has one of the highest MWI, with 11% of plastic estimated to be uncollected in Menorca.

Fishing

Learnings

4 tonnes of fishing gears were estimated to be lost at sea in Menorca in 2018. This amounts to 6% of the total country leakage. More information on the fishing sector can be found in appendix.

D REGIONAL HOTSPOTS

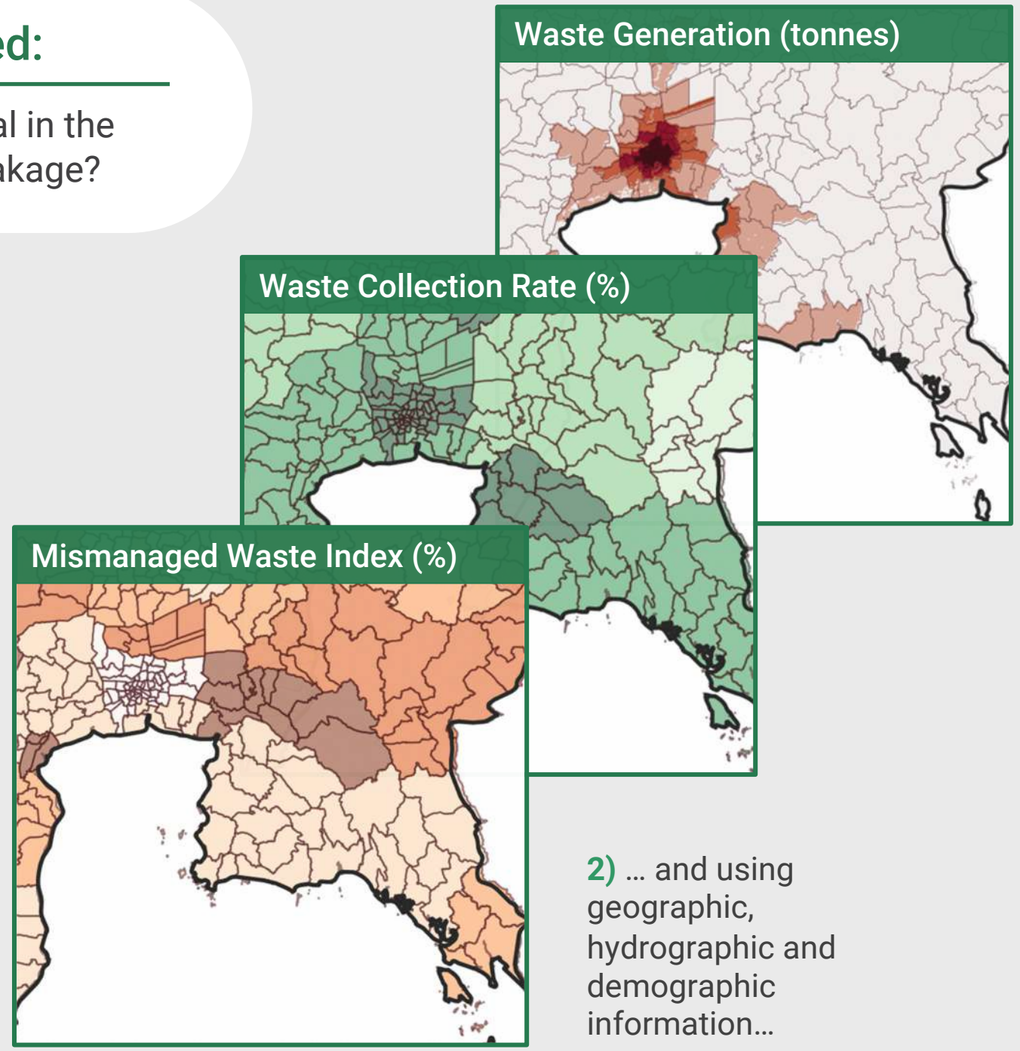


OBJECTIVE AND INSTRUCTIONS

Key question answered:

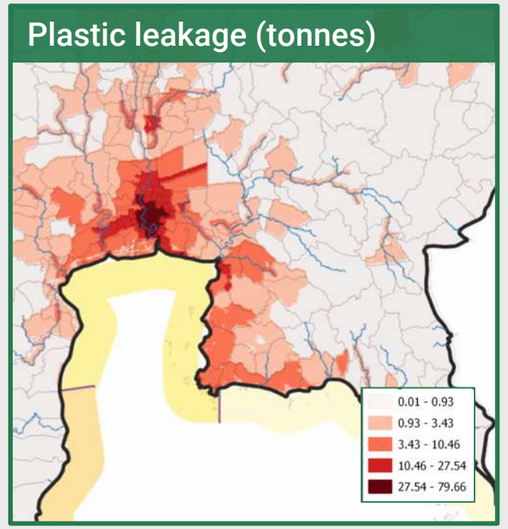
Which areas are most critical in the country regarding plastic leakage?

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



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

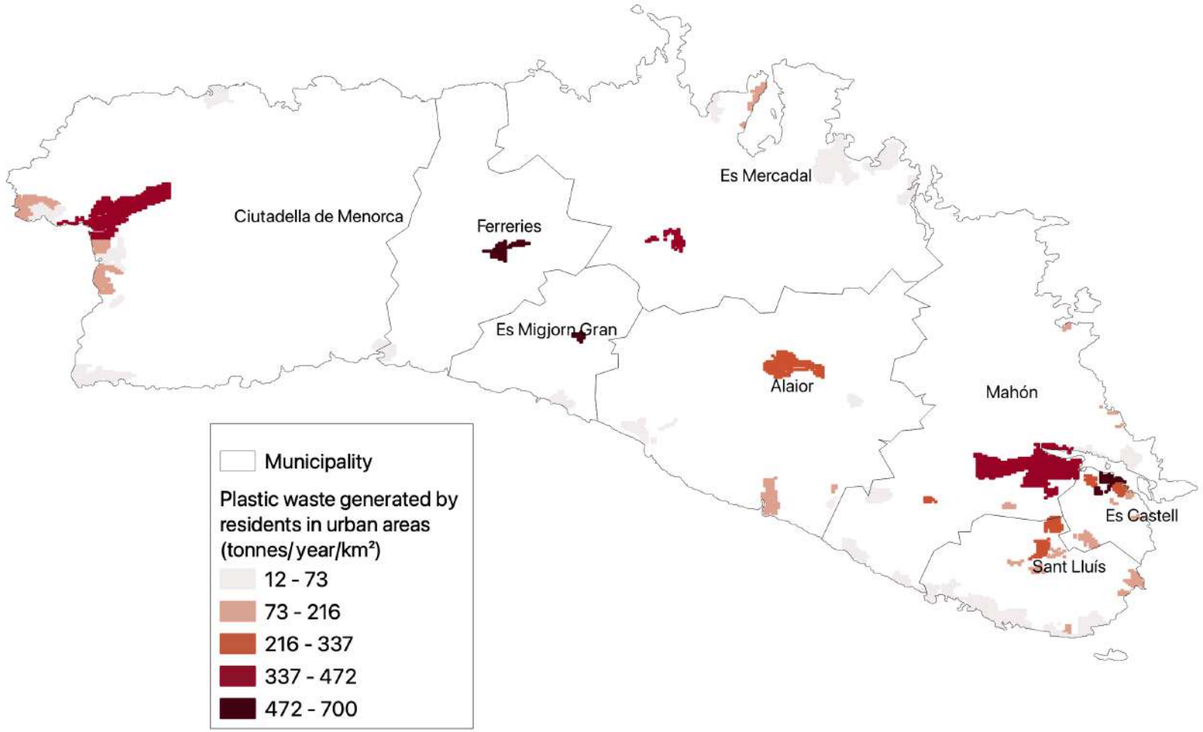
3) … allows to compute a leakage map and identify regional hotspots



WASTE GENERATION FROM RESIDENTS:
MAP AND INTERPRETATIONS [2018]

Plastic waste generation from resident population

7744 tonnes/year



More details available in Appendices

Key take-aways

- Residents contribute to generating 78% of the total of waste generated in Menorca.
- 93% of it is generated in urban areas.

Learnings

- 93% of the waste generated by the resident population comes from urban areas, because 93% of the population lives in urban areas. Mahón et Ciutadella de Menorca have the highest absolute waste generation, while urban nuclei in Es castell, Ferreries and Es Migjorn Gran have the highest waste generation per km².

Limitations

- The map does not show the waste generation distribution in rural areas. Only 7% of the total 7744 tonnes of waste generated by the resident population come from rural areas. Nonetheless, data on waste generation by the rural population per municipality are available in appendix.

Unlocking limitations

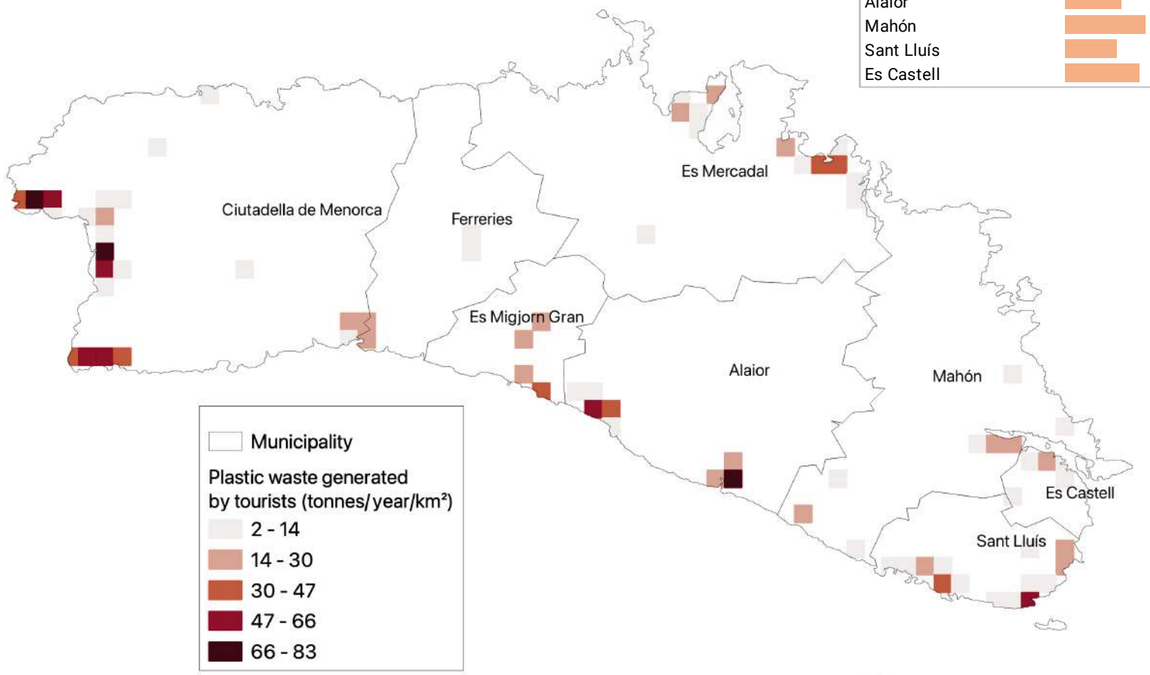
If necessary, gather further information on geographical distribution of the rural population.

WASTE GENERATION FROM TOURISTS:
MAP AND INTERPRETATIONS [2018]

Plastic waste generation from tourist population

2242 tonnes/year

Municipalities	Waste generated on beaches t/y
Ciutadella de Menorca	167
Ferreries	70
Es Migjorn Gran	36
Es Mercadal	47
Alaior	57
Mahón	80
Sant Lluís	51
Es Castell	75



More details available in Appendices

Key take-aways

- Tourists contribute to generate 22% of the total waste in Menorca.
- 26% of the waste generated by tourists is generated on beaches.

Learnings

- In Es Migjorn Gran municipality 55% of the waste is due to tourists, while in Mahón only 6% of the waste is due to tourists.
- In Ferreries and Es Castell most of the waste from tourism activities is generated on beaches.
- 36% of the tourists waste is generated in Ciutadella de Menorca.

Limitations

- We assume that tourists dispose of their waste partly on beaches (60% of their packaging waste) and partly in the vicinity of their overnight stay location.
- We assume waste generation on a beach is proportional to the beach surface area.

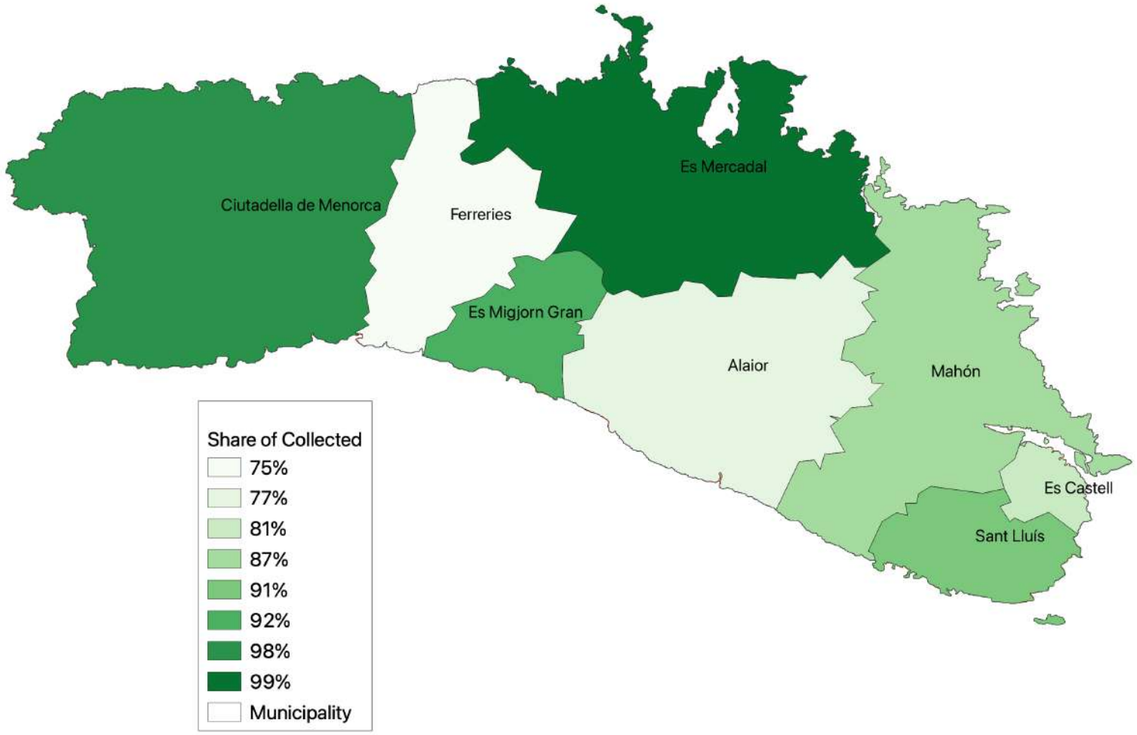
Unlocking limitations

- If necessary, identify specific attractions other than beaches and estimate number of tourists and average time spent there by a tourist in order to allocate part of their waste generated.

WASTE COLLECTION:
MAP AND INTERPRETATIONS [2018]

Average waste collection rate

90%



More details available in Appendices

Key take-aways

- Waste collection averages at 90% on the island of Menroca.

Learnings

- Es Mercadal, at 99%, has the highest collection rate. Ferreries, at 75%, has the lowest collection rate.
- Tourists population distribution by municipalities is critical in order to have a correct picture of waste management.

Limitations

- The waste collection rate by municipality is determined only by looking at the municipal solid waste generation and collection quantities by province. No information was available on non-municipal waste.

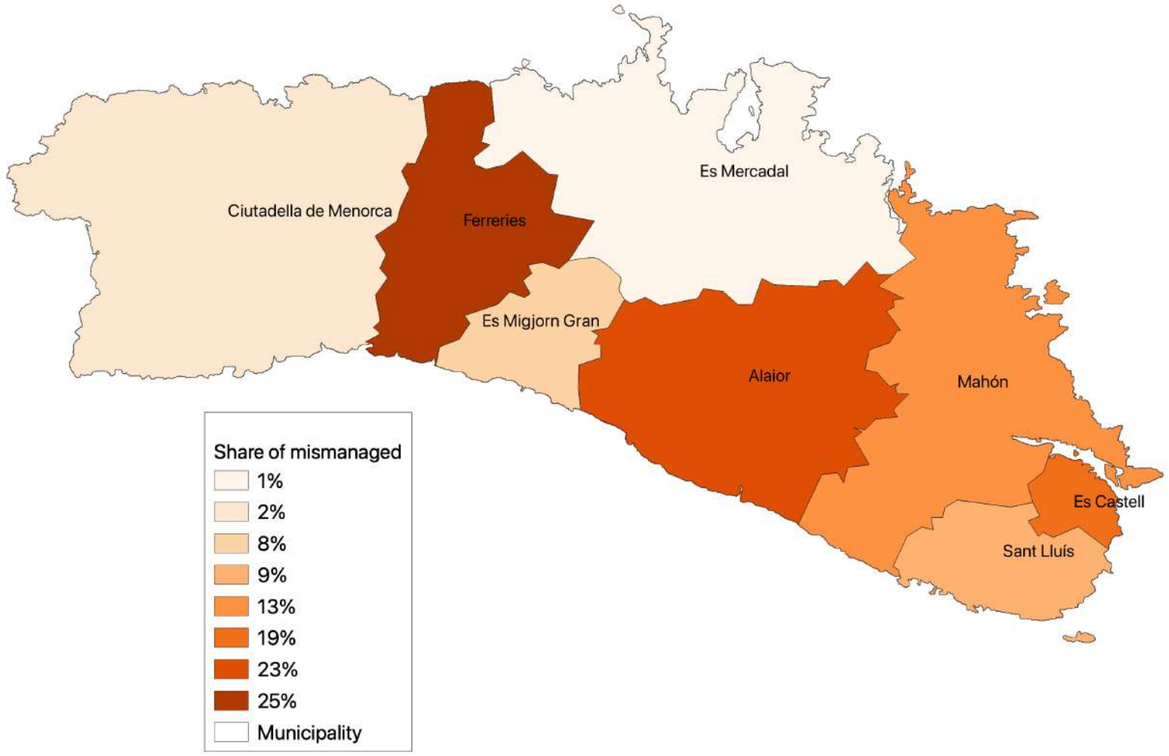
Unlocking limitations

- It is crucial to gather better insight on management of industrial waste, especially from construction and automotive sectors.

MISMANAGED WASTE INDEX:
MAP AND INTERPRETATIONS [2018]

Average waste mismanagement rate

10%



More details available in Appendices

Key take-aways

- The average MWI is 10% in Menorca.
- Waste mismanagement in Menorca is due to uncollected waste.

Learnings

- Generally, mismanaged waste can come either from waste collected but improperly disposed (in open dumps or unsanitary landfills), or from uncollected waste. In Menorca there is no improper disposal of waste, therefore all mismanaged waste comes from uncollected waste.

Limitations

- We are not accounting for mismanagement of waste exported for recycling in the country of destination.

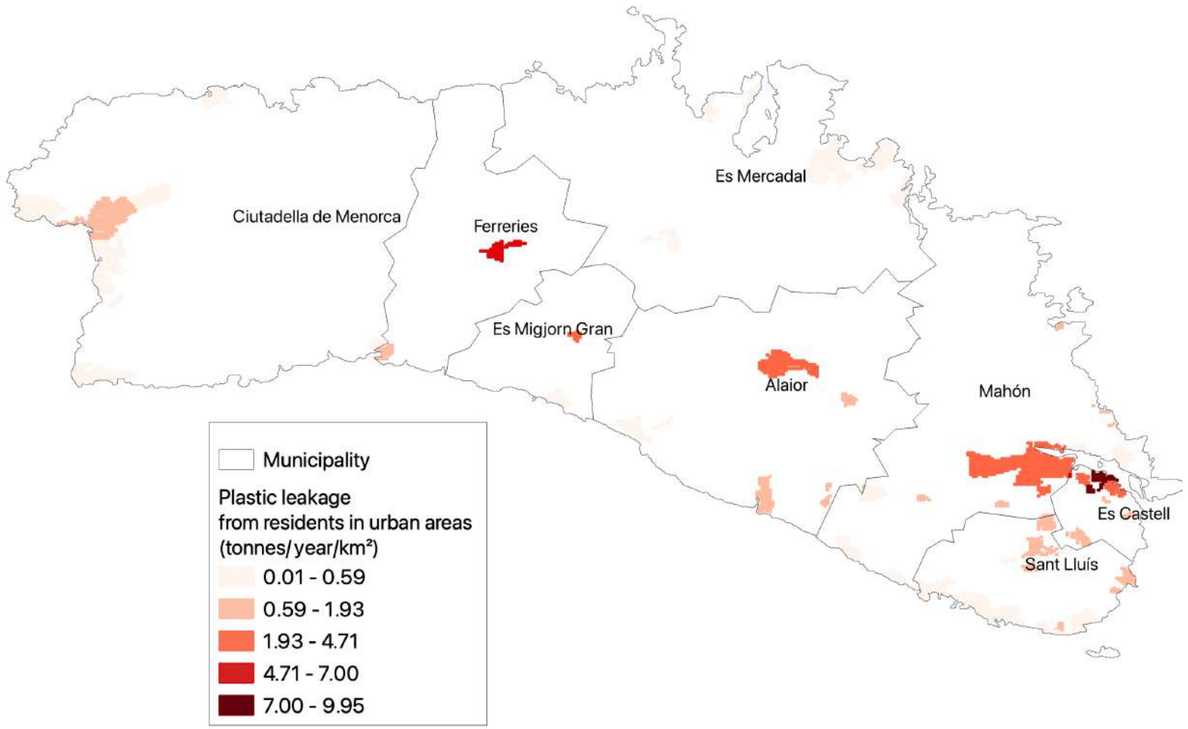
Unlocking limitations

- Gather better insight on the fate of waste exported for recycling. Spain, for example, exports waste primarly to Malaysia, Viet Nam, China, Thailand, where part of the waste is mismanaged.

REGIONAL LEAKAGE FROM RESIDENTS:
MAP AND INTERPRETATIONS [2018]

Leakage of macro-plastics from resident population

53 tonnes / year



More details available in Appendices

Key take-aways

- 53 tonnes of macro-leakage from mismanaged plastic waste are due to the resident population of Menorca.
- On average a resident of menorca contributes to 0.6 kg of plastic leakage per capita per year.
- Only 6% of the total leakage comes from rural areas.

Learnings

- 94% of the leakage due to the resident population comes from urban areas.
- The areas with the highest leakage density are in Es Castell.
- 41% of the leakage generated by the resident population comes from Mahón, due to the high number of resident population and MWI of 13%.

Limitations

It is not possible to visualize on the map the leakage due to the rural population. Nevertheless, its contribution tot the total leakage is of only 6%.

Unlocking limitations

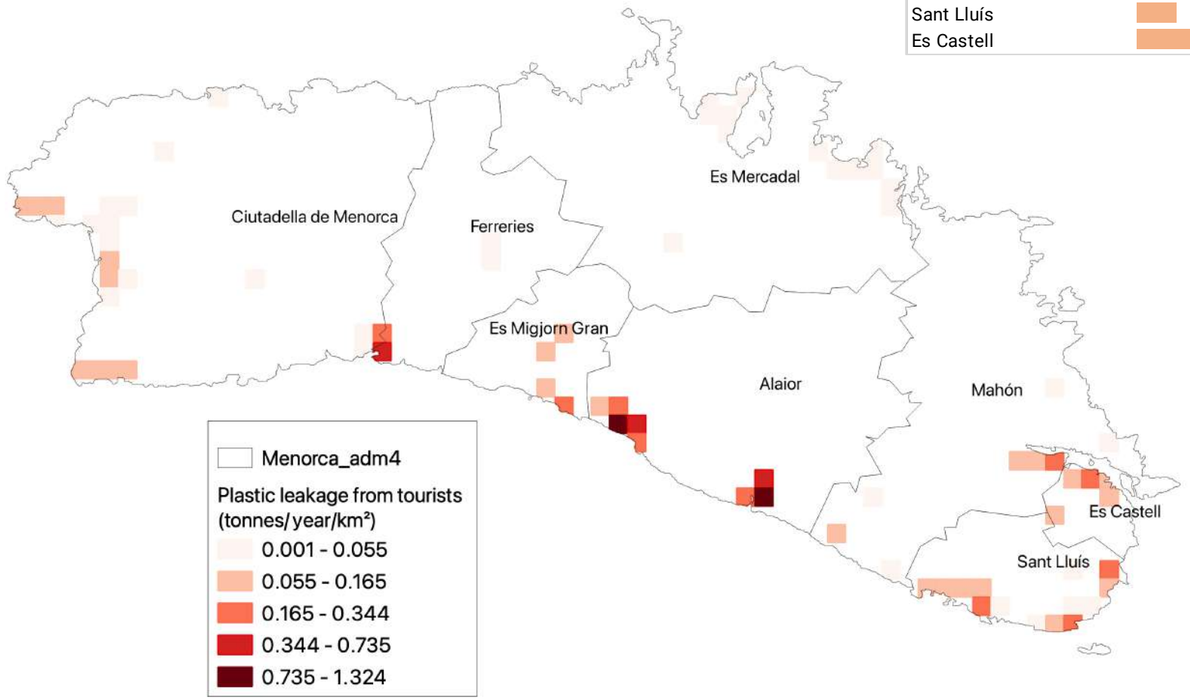
If necessary, gather more granular information of rural population distribution by km^2.

REGIONAL LEAKAGE FROM TOURISTS:
MAP AND INTERPRETATIONS [2018]

Leakage from tourist population

15 tonnes / year

Municipalities	Leakage from beaches t/y
Ciutadella de Menorca	0.3
Ferreries	1.3
Es Migjorn Gran	0.2
Es Mercadal	0.02
Alaior	1.0
Mahón	0.8
Sant Lluís	0.3
Es Castell	1.1



More details available in Appendices

Key take-aways

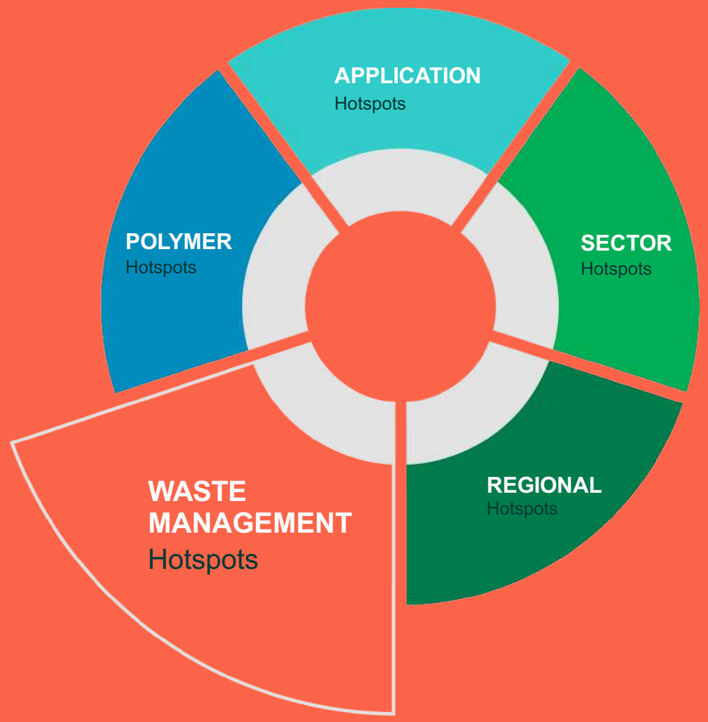
- Tourists cause the leakage of 15 tonnes of plastic/year, i.e. 23% of the total leakage.
- 33% of the tourists leakage comes from beaches.

Learnings

- The municipalities with the most polluted beaches are Ferreries, Es Castell and Alaior, this is mostly caused by the lower collection rates in these municipalities.
- Most of the leakage from tourists in the vicinity of their overnight stay, comes from Alaior, with 4.3 t/y of leakage.

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% 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

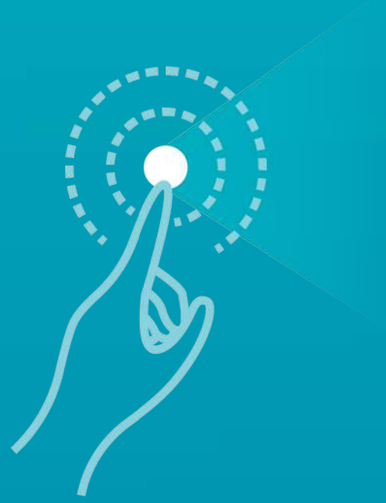
For more details and justifications, check tool T4.1

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

Key take-aways

- Plastic waste per capita generation (111 kg/cap/day) is well above the Western Europe average* (64 kg/cap day).
- In 2018, compostable is still not segregated at source.
- Waste collection rate (90%) is below average in high income countries 96%.
- Waste bins design does not prevent from leakage while waiting for collection.
- Wind and rain are driving release of littered waste within different compartments of the environment.
- Littering is driven by the high tourist season.
- Positive aspects include well-functioning infrastructures, decent cleaning frequency and efficient waste water management.

* 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

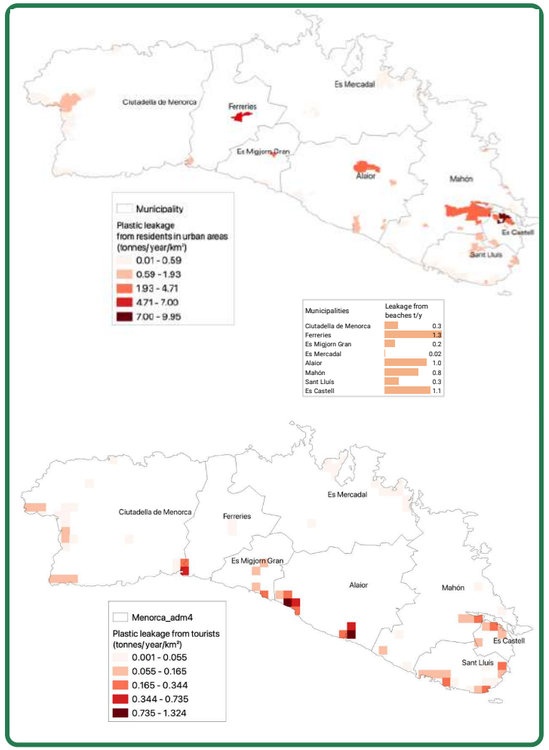
- PET
- LDPE
- PP
- Synthetic Rubber
- HDPE
- Polyester
- PS
- PVC
- Other

Application

Sector

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

Regional



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 **NFRASTRUCTURE**	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

3 highest leakage contributors in absolute OR relative value

Highest leakage contributors in absolute AND relative value

Negative contribution to the leakage

Positive contribution

Neutral contribution

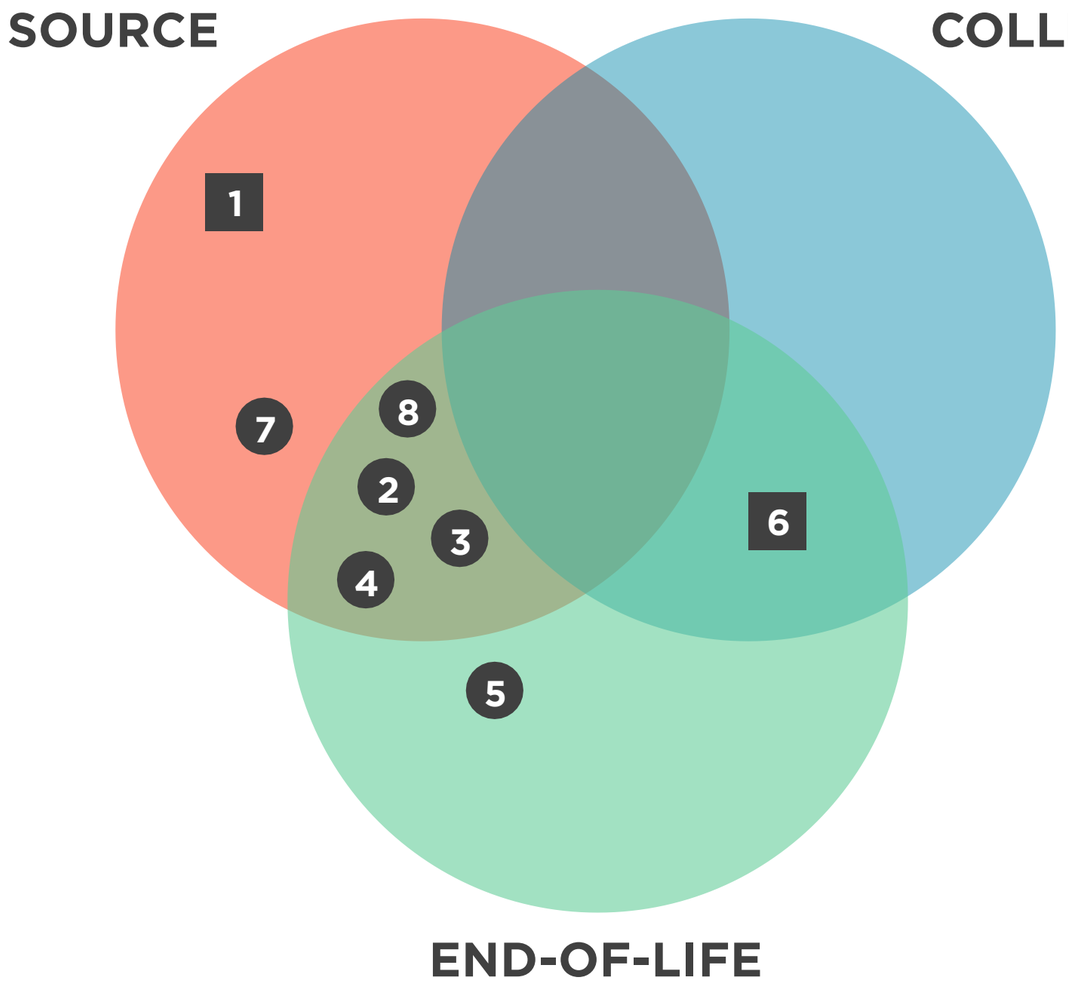
Not assessed

ACTIONABLE HOTSPOTS LIST

[#]	[ACTIONABLE HOTSPOT]	[■/●]
1	Plastic generation per capita in Menorca is well above Western Europe average and is the main driver to leakage.	■
2	PET and LDPE, used for example in bottles or bags respectively, are seriously leaking in Menorca because of a high consumption and littering behaviours.	●
3	Packaging is the most leaking sector in Menorca that consumes important quantities of plastic and covers products with high leakage potential.	●
4	Tourism has also a high leakage impact due to a high number of tourists who probably consume more single-use plastics with a high leakage potential.	●
5	The automotive-tyre and fishing sectors have a moderate plastic leakage impact but have the highest leakage rates driven by micro-plastic from tyre abrasion for the automotive-tyre sector and the potential loss of fishing gears at sea for the fishing sector.	●
6	Plastic waste is leaking because of a lack of adequately designed bins combined with frequent rain and wind that carry plastic items into different environmental compartments, including the ocean and waterways.	■
7	Most of the plastic leakage is stemming from urban areas close to the coast (<2km).	●
8	Beaches are a leakage hotspot as they have high densities of waste generation and leakage.	●

■ **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 Menorca calls for interventions at both plastic source and end-of-life stages.

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

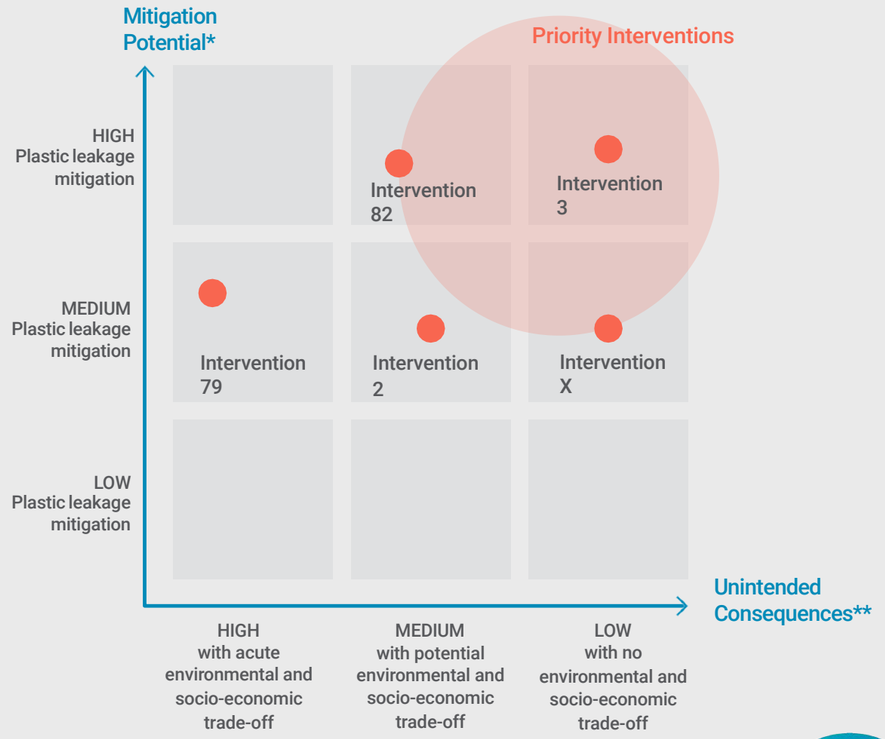
STEP 1: choose up to 3 interventions for each actionable hotspot

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

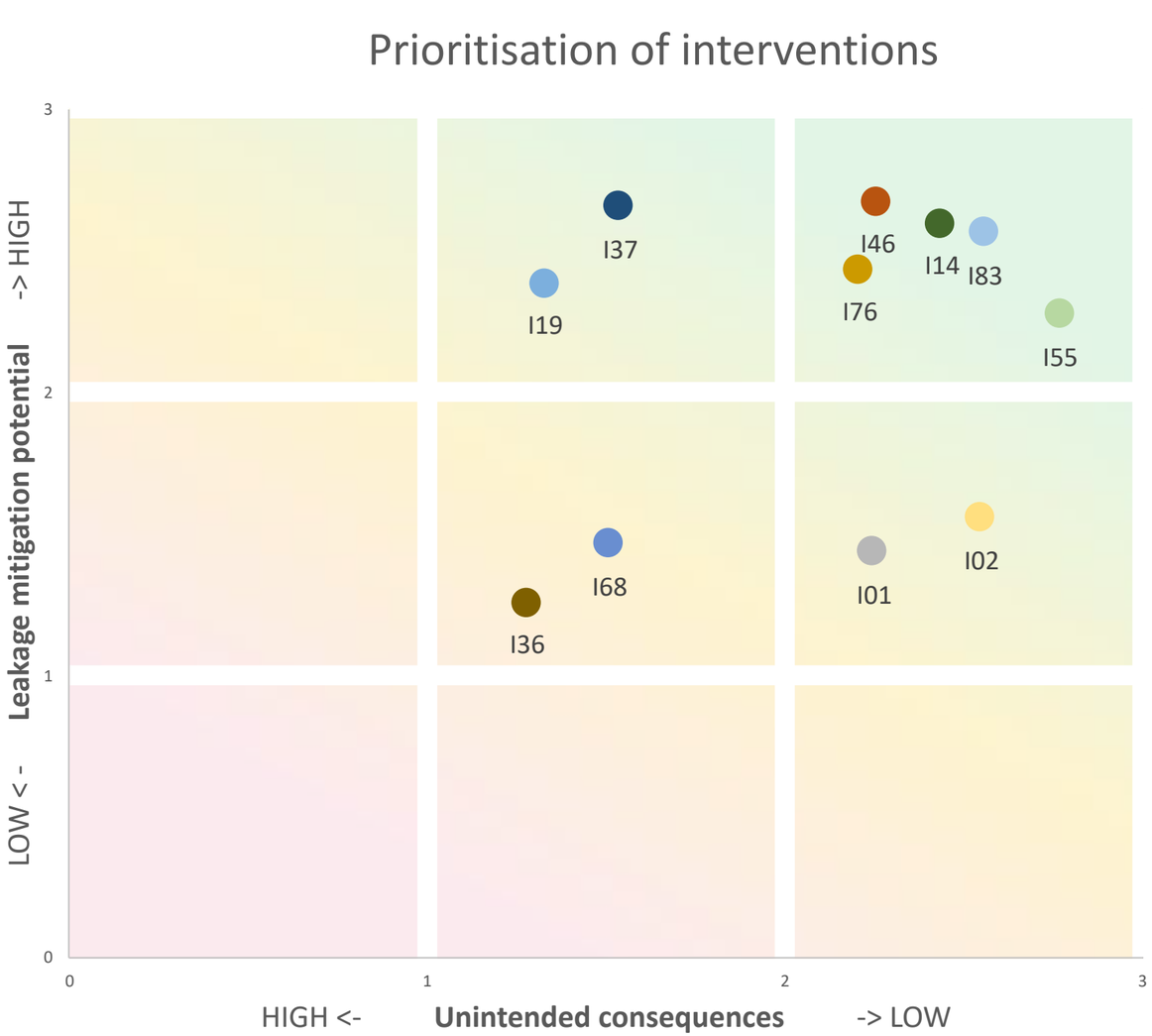
Interventions (I)	Leakage mitigation potential*	Unintended consequences**
I1		
I2	medium	medium
I3	high	low
I4		
I5		
...		
I79	medium	high
I80		
I81		
I82	high	medium
I83		



* **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).

S2

PRELIMINARY SELECTION OF INTERVENTIONS



- I01: Retrieve lost fishing gears from the marine environment
- I02: Clean beaches and/or polluted areas
- I14: Reduce littering in urban areas
- I19: Reduce demand for, and use of, single-use, especially on-the-go, plastics
- 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
- I55: Ensure recuperation of used fishing gears
- I68: Install system to collect road run-off water contaminated with tyre particles
- 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	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**
WASTE COLLECTION SYSTEMS	Plan more frequent waste collection in areas prone to plastic leakage	**I46**
	Ensure recuperation of used fishing gears	**I55**
WASTE INFRASTRUCTURE	Reduce losses from waste management equipment (bins, transport)	**I76**
	Increase density of waste bins in specific areas prone to leakage	**I83**
CLEAN-UP SOLUTIONS	Clean beaches and/or polluted areas	**I02**
	Retrieve lost fishing gears from the marine environment	**I01**

3.2 INSTRUMENTS

METHODOLOGY FOR IDENTIFYING INSTRUMENTS

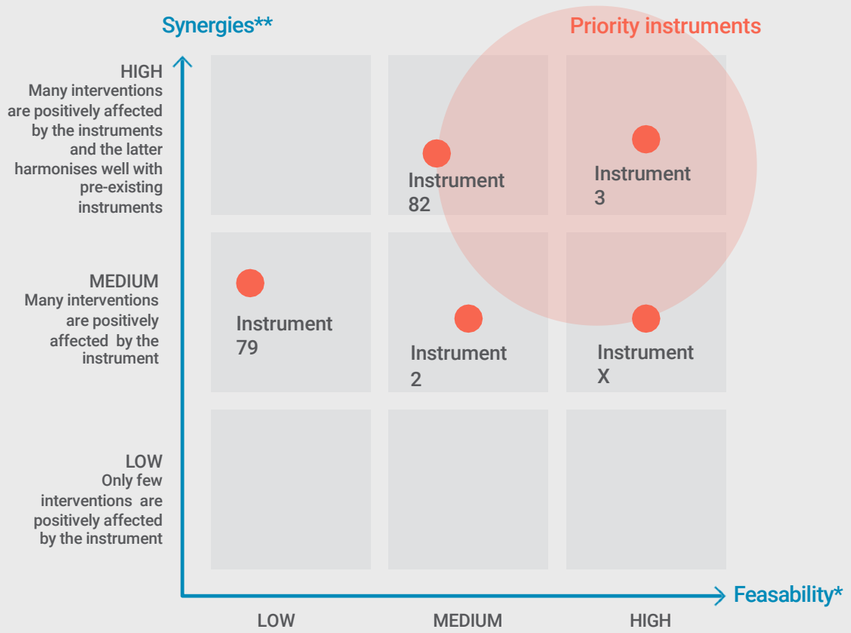
STEP 1: choose up to 3 instruments for each intervention selected in S2

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		

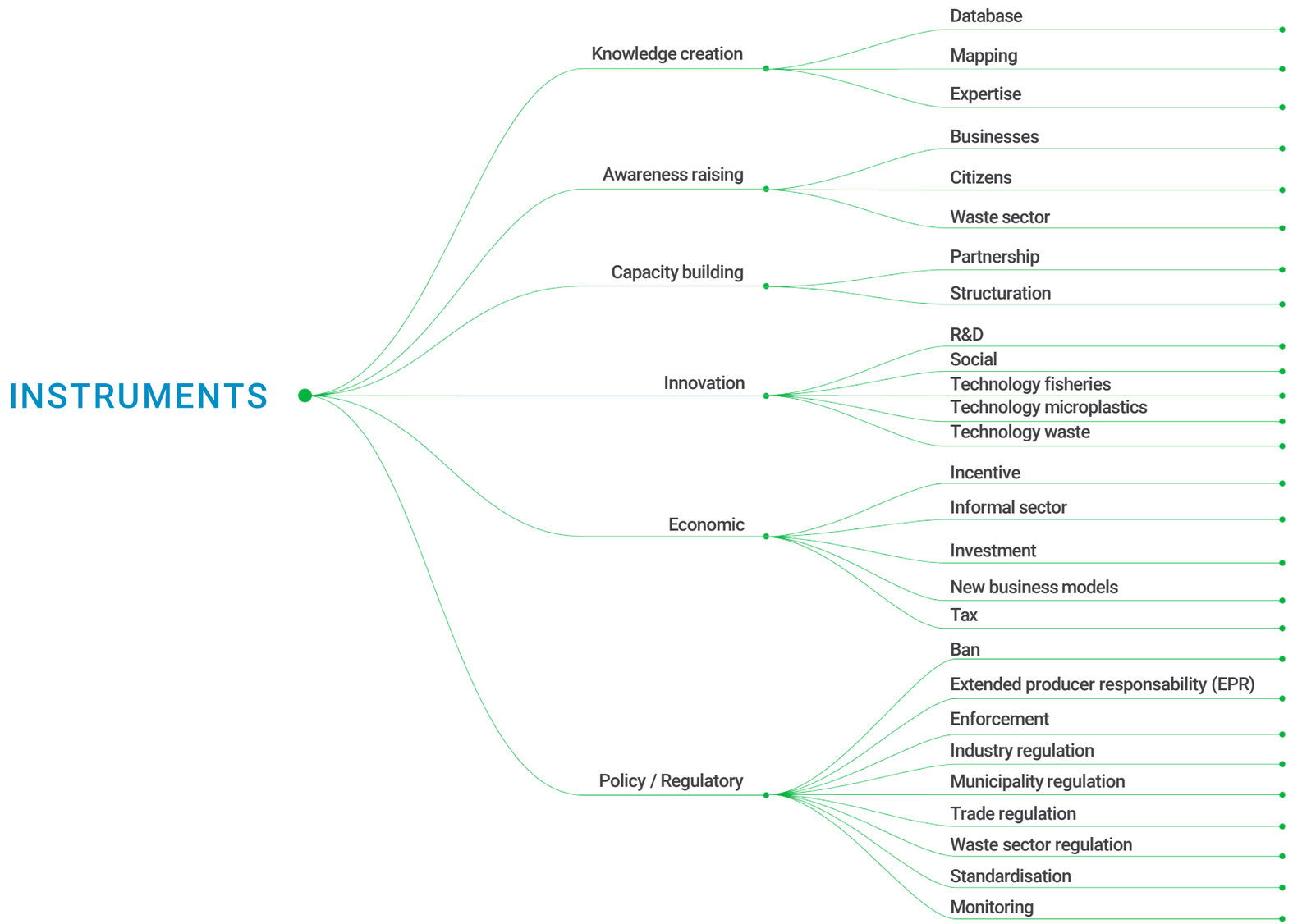


* **Feasability:** technical and socio-economic assessment of each instrument should be performed. We do not assert a method to perform the assessment as this is beyond the scope of the Guidance. The user can decide on the method to use based on resources available. A by default qualitative assessment 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	*1781*	0%	26%	65%	0%	9%	*100%*	91%	9%	1.0%	*1781*	0%
PP	*2642*	0%	7%	87%	0%	6%	*100%*	94%	6%	0%	*2642*	0%
Polyester	*264*	0%	0%	95%	0%	5%	*100%*	95%	5%	0%	*264*	0%
LDPE	*2652*	0%	18%	73%	0%	9%	*100%*	91%	9%	1%	*2652*	0%
HDPE	*663*	0%	25%	63%	0%	12%	*100%*	88%	12%	1%	*663*	0%
PS	*481*	0%	7%	78%	0%	15%	*100%*	85%	15%	1%	*481*	0%
Other	*171*	0%	0%	94%	0%	6%	*100%*	94%	6%	0%	*171*	0%
Synthetic Rubber	*283*	0%	9%	83%	0%	7%	*100%*	93%	7%	2%	*283*	0%
PVC	*1283*	0%	7%	71%	0%	23%	*100%*	77%	23%	0.6%	*1283*	0%
All	*10220*	*0%*	*14%*	*76%*	*0%*	*10%*	*100%*	*90%*	*10%*	*1%*	*10220*	*0%*

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

WASTE MANAGEMENT BY MUNICIPALITY

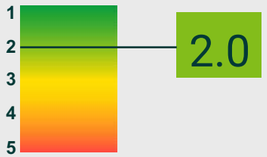
Municipality	Population [resident urban]	Population [resident rural]	Population [tourists]	Generated t [resident urban]	Generated t [resident rural]	Generated t [tourists hotels]	Generated t [tourists beaches]	Share of Collected	Share of Mismanaged	Leaked t [residents urban]	Leakage t [residents rural]	Leaked t [tourists hotels]	Leakage t [tourists beaches]
Ciutadella de Menorca	27109	2114	11516	2284	178	650	167	98%	2%	3.9	0.3	1.2	0.3
Ferreries	4559	136	918	384	11	52	70	75%	25%	5.0	0.2	0.9	1.3
Es Migjorn Gran	1321	49	1836	111	4	104	36	92%	8%	0.5	0.02	0.6	0.2
Es Mercadal	4537	251	3826	382	21	216	47	99%	1%	0.1	0.01	0.1	0.02
Alaior	8296	716	4400	699	60	248	57	77%	23%	8.7	0.9	4.3	1.0
Mahón	27313	1279	1530	2301	108	86	80	87%	13%	20.9	0.8	0.8	0.8
Sant Lluís	6156	736	4400	519	62	248	51	91%	9%	2.7	0.3	1.6	0.3
Es Castell	6878	470	956	579	40	54	75	81%	19%	8.1	0.5	0.7	1.1

4.2 DATA QUALITY ASSESSMENT

POLYMER HOTSPOTS
DATA QUALITY ASSESSMENT

Raw data		Modelling			Final metric	Score
Reliability		Temporal	Geographic	Granularity		
Gaulier, G., & Zignago, 2008 | Trade data for Spain 2018	1	2016 - 2018 1	Plastics Europe plastic by sector (shares) based on EU market + Trade data and production data downsised to Menorca from Spain based on population share (resident + tourist) 2	We determine plastic net input by downscaling the plastic import, export and the production data from Spain to Menorca. The dowscaling is based on the population share of Menorca (incl. tourists) wrt the Spanish population. For classification of trade data by polymer see module T1 (*UNEP, IUCN & Life Cycle Initiative, 2020*). From the net input, manufacturing GDP growth of Spain is used to determine the stock (see module T3 tool T3.2, *UNEP, IUCN & Life Cycle Initiative, 2020*) and consequently the waste generated. 2	Waste generated	2.0
Plastics Europe, 2018 | Sector to polymer mapping	1					
ICIS, 2018 | Production quantities by polymer in Spain	1					
Ports de Balears, 2016 | Import export of cars to Menorca 2016	1					
OBSAM, 2020 | No domestic recycling of plastic in Menorca	1	2018 1	- 1	We attribute the recycled plastic for which the polymer is unknown to the polymer based on their share in the plastic waste (excl. Sinthetic Rubber, Polyester and Other). The recycled quantity for known polymers is added to this. All of the waste collected for recycling is exported 3	Export of waste	3.0
Consorci de residus i energia de menorca, 2018 | Total quantity of plastic collected for recycling (sometimes the polymer is known)	1				Recycled	1.0
This study - Polymer | Plastic waste by polymer (shares)	2.0					
This study - Sector| Properly disposed per sector	3.0	2018 1	Mapping from sector to polymer based on EU 1.5	See module T3, tool T3.2 at *UNEP, IUCN & Life Cycle Initiative, 2020.* 1	Properly disposed	2.0
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 - Polymer | Waste - Export of waste - Domestic recycling - Properly disposed	2.0	2018 1	- 1	Mismanaged = Waste - Export of waste - Domestic recycling - Properly disposed 1	Mismanaged	2.0
This Study - Sector | Leakage by sector	2.13	2018 1	Mapping from sector to polymer based on EU 2	See Polymer flowchart 1	Leaked	2.0
This Study - Polymer | Mismanaged waste by polymer	2.0					

Quality Score

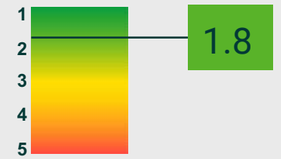


* Data as reported by Vietnam to UN
*** "Recycling of imported waste" together with "recycling of domestic waste" constitute the country's "recycling" bar

SECTOR HOTSPOTS
DATA QUALITY ASSESSMENT

Raw data		Modelling				Final metric	Score
Reliability		Temporal		Geographic		Granularity			
This study - polymer | Total plastic waste generated	2	2018	1	Plastics Europe plastic by sector (shares) based on EU market and not specific to Menorca	2	Mapping of waste generated by polymer to obtain waste generation by sector. See module T3, tool T3.2 at *UNEP, IUCN & Life Cycle Initiative, 2020.*	1	Waste generated	2.0
Plastics Europe, 2018 | Plastic by sector (shares)	1								
Consorci de residus i energia de menorca, 2018 | Plastic waste characterisation for electrical & electronics, automotive-tyres and agriculture sector	1								
Consorci de residus i energia de menorca, 2018 | Plastic collected for recycling by sector	1	2018	1	-	1	-	1	Export of waste	1
OBSAM, 2020 | No domestic recycling of plastic in Menorca	1.0							Recycled	1
Consorci de residus i energia de menorca, 2018 | Total plastic in municipal waste being collected	1	2018	1	Country specific littering habits are not accounted for.	2	See additional notes	3	Properly disposed	3.0
This study - Sector | Waste generated by sector	2.0								
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 | Export for recycling by sector	2								
OBSAM, 2020 | There are some illegal dumpsites	1	2018	1	-	1	Uncollected = Waste - Export of waste - Domestic recycling - Properly disposed - Improperly disposed	1	Mismanaged	1.4
This study - Sector | Waste - Export of waste - Domestic recycling - Properly disposed - Improperly disposed	1.8								
This Study - Sector | Mismanaged	1.4	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
Plastic Leak Project, 2019 | Release Rate by sector (base on product size and value for informal recyclers)	3								
This Study - Regional | Total Macro-leakage	2								

Quality Score



SECTOR HOTSPOTS
MODELLING NOTES (1/2)

Properly disposed

We only have information on waste management for the municipal waste. To extrapolate and have information relative to all waste, we assume that the collection rate of municipal and non-municipal waste is similar. This is just and hypothesis and an in depth analysis on the fate of non-municipal industrial waste is needed, especially for the waste coming from Construction and Automotive sectors.

To compute the collection rate for the municipal waste, we identify some sectors as being treated by the municipal waste management facility. These are: Packaging, Medical, Textile, Automotive-tyres, Electrical and Electronics, Fishing, and Agriculture. While the remaining sectors are considered as non-municipal. Tourism is not considered in this analysis (see additional notes on tourism). We compute the share of municipal waste collected as: municipal waste collected / tot municipal waste generated. This value is then use to determine the total waste collected. We distribute the total waste collected by sector based on the non-littered and non micro-leaked share of waste that each sector has, i.e. collected by sector = (waste - littered - micro-leaked by sector)/ (tot waste - tot littered - tot micro-leaked)*tot waste collected.

The properly managed part of the collected = collecte - export of waste (- recycled = 0).

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 PLP (2019). Its contribution to leakage is included in “Automotive-tyres”. Data on vehicle numbers for 2018 were provided by OBSAM and average distance travelled is based on the average in Spain for 2017 (Enerdata, 2020) which is arbitrarily divided by two as car usage on the island is assumed to be less than on mainland).
- **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)

SECTOR HOTSPOTS
MODELLING NOTES (1/2)

Fishing: Data on number of fishing vessels (artisanal and commercial) comes from OBSAM. We assume artisanal vessels have one longline and one gillnet, while commercial vessel use on midwater trawl. By default plastic weights by fishing gear type were derived from technical designs found in multiple publications including FAO and Nédélec et al., 1990. Combining these two pieces of information yields the net plastic input from fishing gears. By estimating the lifetime of a fishing net and by looking at the GDP growth of Spain, we estimate the amount of fishing nets going to waste from previous years.

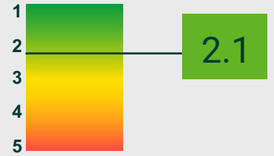
Medical: In order to know the amount of plastic going to waste from the medical sector we multiply the number of hospital beds in Menorca (OBSAM, 2020) by the occupancy rate (80%), the amount of waste generated per bed per day (Minoglou et al., 2017), and the plastic share of medical waste (20%).

Tourism: Data on number of tourists and average stay length comes OBSAM. We assume tourist and local population have the same daily plastic waste generation. We assume that tourists contributes to waste generation in all sectors, not only packaging. For example, cars are made available for renting for tourists (automotive-tyres and automotive-others). We therefore compute all waste management quantities for the tourism sector by computing the analysis without the tourism sector and the allocating a share of each sector to the tourism based on the tourist population share. The tourist population share is computed as = nb tourists*average lenghts of stay / 365 / total resident population.

REGIONAL HOTSPOTS
DATA QUALITY ASSESSMENT (1/2)

Raw data		Modelling			Final metric	Score
Reliability		Temporal	Geographic	Granularity		
This study - Polymer | Waste generated per capita per sector	2					
OBSAM, 2020 | Resident population of menorca and distribution by urban nuclei, + rural/urban split. Area and localization of main beaches in Menorca.	1					
SIT, 2018 | Number of beds per region	1					
CIESIN, 2018 | NASA population forecast for 2020 on 1km2 grid	1.5					
OBSAM, 2020| Total number of tourists + average length of stay	1	2018 1	See additional notes 2	- 1	Waste generated	2
Consorci de residus i energia de menorca, 2018 | Plastic waste collected for recycling by region	1	2018 1	- 1	- 1	Collected for recycling	1.0
Consorci de residus i energia de menorca, 2018 | Municipal plastic waste collected by region	1	2018 1	We compute the collection rates for municipal waste by municipality as: municipal plastic waste generated by municipality / (municipal waste collected). To have only the properly disposed part, we remove the collected for recycling 3	- 1.5	Properly disposed	3.0
This study - Regional | Waste - Collected for recycling - Properly disposed	2.0	2018 1	- 1	Uncollected = Waste - Collected for recycling - Properly disposed - Improperly disposed 1	Mismanaged waste	2.0

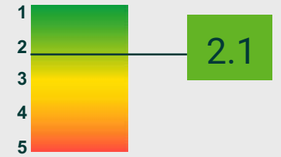
Quality Score



REGIONAL HOTSPOTS
DATA QUALITY ASSESSMENT (2/2)

Raw data		Modelling				Final metric	Score
Reliability		Temporal		Geographic	Granularity		
This Study - Regional | Mismanaged	2.0	2018	1	- 1	Share of mismanaged by province = Waste mismanaged by province / waste generated by province 1	Share of Mismanaged	2.0
This Study - Regional | Waste generated by province	2.0						
This study - Regional | Collected = Collected for recycling + Properly disposed + Improperly disposed	2.0	2018	1	- 1	Share of collected = Waste mismanaged by province / waste generated by province 1	Share of Collected	2.0
Richardson et al., 2019 | Loss rate by fishing gear type	2	2019 1990 2018	2.5	- 1	See additional notes 2	Leakage from fishing sector	2.5
Nédélec et al., 1990 | Drawings of various fishing gear	2						
This study - Sector | Fishing gear used in Menorca by type (including its plastic content)	3						
This study - Regional | MWI by province	2.0	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)

SECTOR HOTSPOTS MODELLING NOTES

Properly disposed

We identified 4 sources of waste generation: resident urban population, resident rural population, tourists at hotels, and tourists on beaches.

We assume that urban resident population and rural resident have the average per capita waste generation for Menorca. The average per capita waste generation is computed as: tot plastic waste / (resident population + tourist population). Where the tourist population = nb tourists* average length of stay/365.

For the resident urban population, we have access on very detail spatial population distributions by urban nuclei within the different municipalities. For the rural population instead we only have data by municipalities, but we lack a more granular spatial information.

For the tourist population we have information of hotel localization and for each hotel we know the number of beds. The number of tourists by municipality is determined as : nb beds per municipality/ tot nb of beds * tourist population. For the waste generation of tourists on beaches, we assume that the tourists presence on a beach is proportional to the area of the beach. Additionally we assume that tourists dispose on beaches 60% of their per capita plastic packaging waste. The remaining per capita plastic waste is attributed to tourists at hotels.

This more elaborated and more granular split is done to reconciliate waste management data for municipalities such as Es Mercadal where plastic waste collection is higher than plastic waste generated by the resident population and by the tourists at hotels. Only when considering the additional waste generated by the tourists activities on the beaches we are able to recover a consistency between waste generation and waste collection

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 → set to zero for Menorca

3) Leakage from plastic waste littered overboard by some fishermen → set to zero for Menorca;

To know how many fishing gear by type see Additional notes of sector hotspot analysis. 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.

5 BIBLIOGRAPHY

BIBLIOGRAPHY (1/2)

Autoritat Portuària De Balears (2016). Memòria annual 2016.

Boopendranath, M. (2012). Basic principle of fishing gear desing and classification.

Boucher, J. et al. (2019). The Marine Plastic Footprint. IUCN.

Center for International Earth Science Information Network - CIESIN - Columbia University (2018). Population Estimation Service, Version 3 (PES-v3). Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). https://doi.org/10.7927/H4DR2SK5.

Clean Virginia Waterways, Longwood University (2008). Cigarette butt litter. Available at: http://www.longwood.edu/cleanva/cigbutthowmany.htm

Concell Insular de Menorca (2017). Memòria - Pla director sectorial per a la gestió de residus no perillosos de Menorca 2017-2025.

Consorci de residus i energia de Menorca (2018). Informe de situació de la gestió dels residus a Menorca.

Espinosa-Valdemar, R. M et al. (2015). Assessment of gardening wastes as a co-substrate for diapers degradation by the fungus Pleurotus ostreatus. Sustainability, 7(5), 6033-6045.

European Commission (2018). Plastics: Reuse, recycling and marine litter, final report.

Gaulier, G. et al. (2008). BACI: A world database of international trade at the product-level. CEPII wp.

Geyer, R. et al. (2017). Production, use, and fate of all plastics ever made. Science advances, 3(7), e1700782.

IBESTAT - Balearic Islands Statistical Institute (2020). Població. Available at: http://ibestat.caib.es/ibestat/estadistiques/

ICIS, Independent Commodity Intelligences Services (2020). Plastic production in Viet Nam for 2018. https://www.icis.com/explore/

Jambeck, J. et al.. (2015). Plastic waste inputs from land into the ocean. Science, 347(6223), 768-771.

Kaza, S. et al (2018). What a Waste 2.0 : A Global Snapshot of Solid Waste Management to 2050. Urban Development;. Washington, DC: World Bank. © World Bank. https://openknowledge.worldbank.org/handle/10986/30317 License: CC BY 3.0 IGO

Kishan, W. et al. (2018). Design characteristics and technical specifications of mackerel gill nets of Sindhudurg, Maharashtra. Journal of Experimental Zoology, India, 21(1), 373-378.

Kostova, D. et al. (2014). Exploring the relationship between cigarette prices and smoking among adults: a cross-country study of low-and middle-income nations. nicotine & tobacco research, 16(Suppl_1), S10-S15.

Lau, W. W. et al. (2020). Evaluating scenarios toward zero plastic pollution. Science, 369(6510), 1455-1461.

Lebreton, L. C et al. (2017). River plastic emissions to the world's oceans. Nature communications, 8, 15611.

Lehner, B. et al. (2013): Global river hydrography and network routing: baseline data and new approaches to study the world's large river systems. Hydrological Processes, 27(15): 2171–2186. Data is available at www.hydrosheds.org.

Lehner, B. et al. (2008): New global hydrography derived from spaceborne elevation data. Eos, Transactions, AGU, 89(10): 93-94. Data is available at www.hydrosheds.org.

Mendoza, J. M. F. et al. (2019). Improving resource efficiency and environmental impacts through novel design and manufacturing of disposable baby diapers. Journal of Cleaner Production, 210, 916-928.

BIBLIOGRAPHY (2/2)

Minoglou, M. et al. (2017). Healthcare waste generation worldwide and its dependence on socio-economic and environmental factors. Sustainability, 9(2), 220.

Nédélec, C. et al. (1990). Definition and classification of fishing gear categories (No. 222). FAO.

OBSAM (2020). Recycling indicators for Menorca; Occupancy rate, area and localization of main beaches of Menorca; Resident population by urban nuclei and rural areas.

ODYSSEE-MURE (2020). Sectoral profile – Transport.

Pérez, M. et al. (2018). Sistema d'Indicadors Turístics de Menorca 2018. Observatori Socioambiental de Menorca, Institut Menorquí d'Estudis.

PlasticsEurope (2018). Plastic - the Facts 2018.

PLP (2020). Plastic Leak Project. (https://quantis-intl.com/metrics/initiatives/plastic-leak-project/)

Ports de Balears, Autoritat Portuària de Balears, (2016) 2016 Memoria Anual, Annual report.

Prado, J. et al. (1990). Fisherman's workbook. Fishing News Books.

Queirolo, D. et al. (2009). Improved interspecific selectivity of nylon shrimp (Heterocarpus reedi) trawling in Chile. Latin American Journal of Aquatic Research, 37(2), 221-230.

Richardson, K. et al. (2019). Estimates of fishing gear loss rates at a global scale: A literature review and meta-analysis. Fish and Fisheries, 20(6), 1218-1231.

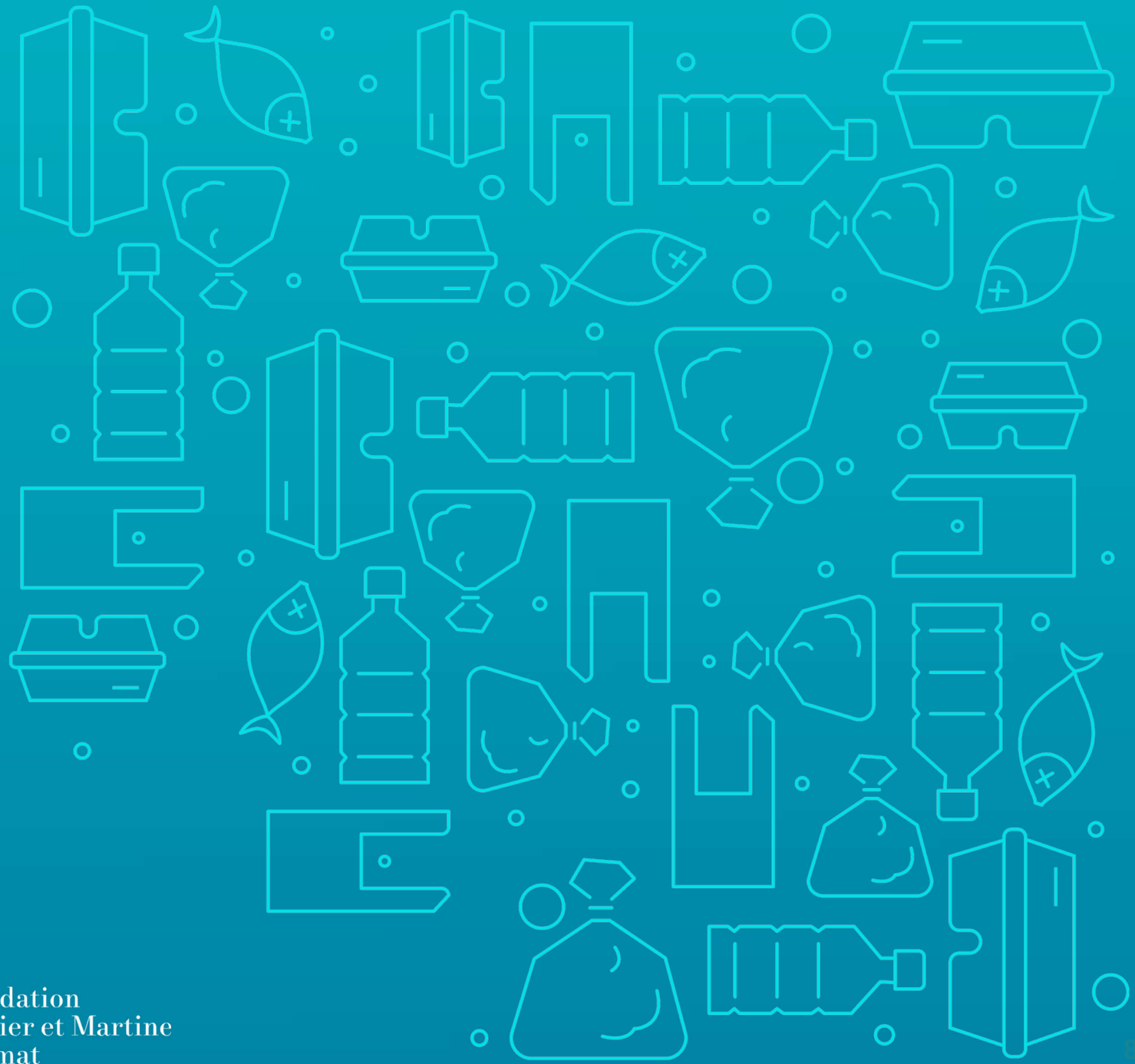
Tecnoambiante (2020). Estudi sobre la generació i composició dels residus municipals a la comunitat autònoma de les Illes Balears.

The World Bank, World Development Indicators (2012). Industry (including construction), value added (annual % growth). Retrieved from https://data.worldbank.org/indicator/NV.IND.TOTL.KD.ZG

UN Environment (2018). "Table A3. Use share of polymer resin production according to plastic application" in Mapping of global plastics value chain and plastics losses to the environment (with a particular focus on marine environment). Ryberg, M., Laurent, A., Hauschild, M.(2018) United Nations Environment Programme. Nairobi, Kenya

MENORCA
Country report

Published in December 2020,
with results for year 2018



Implemented with ea + Quantis

Funded by the Didier et Martine Primat Foundation

Fondation Didier et Martine Primat