Plastic pollution hotspots: South Africa

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### SUMMARY AT A GLANCE

**Global view on plastic in South Africa**

- **70%** Collection rate
- **40%** Mismanaged rate
- **14%** Domestic recycling rate

**79 Kt** Leakage  |  **1.4 Kg** Per capita leakage

### Hotspots

**Most critical polymers**

<table>
<thead>
<tr>
<th>Polymer</th>
<th>Leakage</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDPE</td>
<td></td>
</tr>
<tr>
<td>PET</td>
<td></td>
</tr>
<tr>
<td>PP</td>
<td></td>
</tr>
<tr>
<td>Synthetic rubber</td>
<td></td>
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<tr>
<td>Polyester</td>
<td></td>
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<tr>
<td>HDPE</td>
<td></td>
</tr>
<tr>
<td>PS</td>
<td></td>
</tr>
<tr>
<td>PVC</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

### Shaping action from the hotspots

- **14** Actionable Hotspots
- **15** Priority Interventions

**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 9 Provinces** responsible for 50% of the plastic leakage
INTRODUCTION TO THE GUIDANCE
Provides the objectives of the Guidance, and introduces its associated workflow and main deliverables.

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.

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

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

BIBLIOGRAPHY
Plastic pollution hotspots: South Africa

**Structure and Objective of This Presentation**

**Plastic Pollution Hotspots**

1. **Country Overview**
   - Provides an outlook of the leakage assessment at the country level.

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.

3. **Actionable Hotspots**
   - Formulates clear statements based on the detailed hotspot analysis to help shape action towards plastic leakage abatement.

4. **A. Polymer Hotspots**
5. **B. Application Hotspots**
6. **C. Sector Hotspots**
7. **D. Regional Hotspots**
8. **E. Waste Management Hotspots**
STRUCTURE AND OBJECTIVE OF THIS PRESENTATION

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.
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.

BIBLIOGRAPHY
ICONS AND COLOUR CODE TO GUIDE THE READER

- Reference to the methodology (module/tool)
- Reference to the appendices
- Key take away as the main conclusion of a graph or result in a written format
- Learnings, that complement the key take aways with more details, of information that is not necessarily visible on the graph
- Limitations of the study, can be inaccurate data or gap in the modelling
- 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 sideways. They may or may not be collected by municipal street cleaning.

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

**Mismanaged waste:** It is defined as the sum of uncollected and improperly managed waste. The mismanaged waste index is the ratio of the mismanaged waste and the total waste. It is abbreviated as MWI and its value given in percentage.

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

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

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

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

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

**Formal sector:** Waste management activities planned, sponsored, financed, carried out or regulated and/or recognized by the local authorities or their agents, usually through contracts, licenses or concessions.

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

WHAT WE MEAN BY PLASTIC LEAKAGE / IMPACTS

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

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

1. Mass of macroplastic waste
   Land sources of plastic waste
   (including imports and exports, domestic production and change of stock)
   ➔

2. Collection
   Collected
   (through the formal waste collection system or informal sector)
   ➔

3. Waste management
   Collected for recycling
   Properly disposed
   • Sanitary landfills
   • Incineration facilities
   ➔
   Improperly disposed
   • Dumpsites
   • Unsanitary landfills
   ➔
   Mismanaged
   →
   Export of waste
   →
   Domestic recycling
   →

4. Leakage to waterways and ocean
   →
   Leakage
   Uncollected
   →
   Uncollected
   →
**KEY ABBREVIATIONS AND UNITS**

### Polymer abbreviations

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

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

### Key units

<table>
<thead>
<tr>
<th>NAME</th>
<th>SYMBOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kilogram</td>
<td>kg</td>
</tr>
<tr>
<td>Tonne</td>
<td>t</td>
</tr>
<tr>
<td>Kilo tonne (or thousand tonne)</td>
<td>kt</td>
</tr>
<tr>
<td>Mega tonne (or million tonne)</td>
<td>Mt</td>
</tr>
<tr>
<td>Kilometer</td>
<td>km</td>
</tr>
<tr>
<td>Square kilometer</td>
<td>km²</td>
</tr>
</tbody>
</table>

### Calculation variables

<table>
<thead>
<tr>
<th>NAME</th>
<th>ABBREVIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mismanaged waste index</td>
<td>MWI</td>
</tr>
<tr>
<td>Leakage rate</td>
<td>LR</td>
</tr>
<tr>
<td>Release rate</td>
<td>RR</td>
</tr>
</tbody>
</table>
1 INTRODUCTION TO THE GUIDANCE

National guidance for plastic pollution hotspotting and shaping action
The guidance allows users to:
1. Generate country-specific plastic waste management datasets
2. Identify plastic leakage and pollution hotspots
3. Prioritise actions

**SCHEMATIC OF THE GUIDANCE**

**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

<table>
<thead>
<tr>
<th>MODULES</th>
<th>INPUT TOOLS</th>
<th>ASSESSMENT TOOLS</th>
<th>OUTPUT TOOLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Inventory of plastic flows</td>
<td>COMTRADE data extraction</td>
<td>Raw data repository</td>
</tr>
<tr>
<td>T2</td>
<td>Characterisation of waste management</td>
<td>Polymer/applications sector MFA &amp; leakage calculation</td>
<td>Project data repository</td>
</tr>
<tr>
<td>T3</td>
<td>Modelling polymer/application/sector hotspots</td>
<td>MFA modelling quality assessment</td>
<td>Actionable hotspot formulation</td>
</tr>
<tr>
<td>T4</td>
<td>Identification of waste management hotspots</td>
<td>Waste management hotspot canvas</td>
<td>Final intervention and instrument pairing</td>
</tr>
<tr>
<td>T5</td>
<td>Modelling regional hotspots</td>
<td>GIS model</td>
<td>Actionable hotspot formulation</td>
</tr>
<tr>
<td>T6</td>
<td>Assessing impacts</td>
<td>Plastic application impact assessment</td>
<td>Actionable hotspot formulation</td>
</tr>
<tr>
<td>S1</td>
<td>Actionable hotspot formulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td>Intervention identification</td>
<td>Interventions prioritisation</td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td>Instrument alignment</td>
<td>Instruments prioritisation</td>
<td></td>
</tr>
</tbody>
</table>
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
Summary of the results for all plastics in the country

<table>
<thead>
<tr>
<th>Thousand tonnes/year</th>
<th>Waste Import</th>
<th>Import of products</th>
<th>Import and production of primary</th>
<th>Waste: 2389</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Domestic: 2371</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Imported: 18</td>
</tr>
<tr>
<td>Waste Import</td>
<td>18</td>
<td>904</td>
<td>2743</td>
<td></td>
</tr>
<tr>
<td>Export of primary and products</td>
<td>1084</td>
<td>192</td>
<td>352</td>
<td></td>
</tr>
<tr>
<td>Change in stock</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste export</td>
<td>12</td>
<td>12</td>
<td>1066</td>
<td>223</td>
</tr>
<tr>
<td>Recycling</td>
<td>223</td>
<td></td>
<td>657</td>
<td></td>
</tr>
<tr>
<td>Properly disposed</td>
<td>223</td>
<td></td>
<td>657</td>
<td></td>
</tr>
<tr>
<td>Improperly disposed</td>
<td></td>
<td></td>
<td></td>
<td>79</td>
</tr>
<tr>
<td>Uncollected</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leakage</td>
<td></td>
<td></td>
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</tbody>
</table>

Key take-aways

- Almost all plastic that is consumed in South Africa is manufactured in the country from locally produced or imported primary or secondary plastic.
- South Africa generates 2'371 thousand tonnes of plastic waste annually.
- Per capita plastic waste generation is around 41 kg/cap/year which is above the global average of 29 kg/cap/year*.
- 70% of the plastic waste generated in South Africa is collected, from which 14% is recycled, 45% is disposed in sanitary landfills or incineration facilities, and the remaining 11% disposed in unsanitary landfills or dumpsites.
- In South Africa, 79 thousand tonnes of plastic leak to the ocean and main rivers every year. This leakage corresponds to 3% the quantity of plastic waste generated in the country per year.
- Approximately 40% of plastic waste is mismanaged.
- Burning of waste does not appear in the graph but is an existing practice in South Africa, although less widespread than in other African countries.

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

Note: For simplicity, in this figure, we removed a part of the “leakage” from the “improperly disposed” and “uncollected”, so that the values displayed for these two metrics correspond to a post-leakage situation.
Micro-plastic leakage accounts for 8% of the overall country leakage. This is mostly driven by tyre abrasion.

Limitations

Recycling has not been considered as a source of leakage although informal practices may generate leakage of microplastics. No data was found on this aspect.

Key take-aways

* The methodology used to calculate micro-plastics leakage is based on the Plastic Leak Project (2019)
Open Burning: A Rough Estimate

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

**Key take-aways**

- 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 South Africa, it would translate into having 48% of the total plastic mismanaged ending up polluting the air through open burning.

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

**Limitations**

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

---

**959 kt**

Total plastic mismanaged

**48%**

released into the air as noxious chemical substances through open burning

**Pollution to the Air:**

**461 kt**
**DOMESTIC RECYCLING AND TRADE OF WASTE**

**Key take-aways**
- Only 14% of the domestically generated plastic waste is eventually recycled.

**Learnings**

In 2018, South Africa recycles 352 kt of plastic waste (15% of a total 2389 kt of plastic waste), from which 18 kt come from imported waste. The remaining 334 kt of recycled plastic waste come from domestically generated waste. Consequently, almost all recycled plastic comes from domestically generated plastic waste.
2.2 **DETAILED HOTSPOTS RESULTS**
5 CATEGORIES OF HOTSPOTS

WHAT is leaking?

POLYMER Hotspots

APPLICATION Hotspots

SECTOR Hotspots

WASTE MANAGEMENT Hotspots

REGIONAL Hotspots

WHERE is it leaking?

WHY is it leaking?

WHAT

WHERE

WHERE

WHY

ACTIONABLE HOTSPOTS FORMULATION

Plastic pollution hotspots: South Africa 27
A POLYMER HOTSPOTS
OBJECTIVE AND INSTRUCTIONS

Key question answered:
Which polymers are most critical in the country regarding plastic leakage?

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.
**Plastic pollution hotspots: South Africa**

**MASS BALANCE BY POLYMER [2018]**

<table>
<thead>
<tr>
<th>Polymer</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDPE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PET</td>
<td></td>
<td></td>
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<tr>
<td>Synthetic Rubber</td>
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<tr>
<td>HDPE</td>
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<tr>
<td>PVC</td>
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<td></td>
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<tr>
<td>Polyester</td>
<td></td>
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<td>PS</td>
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<tr>
<td>Other</td>
<td></td>
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</tr>
</tbody>
</table>

**Quality Score**

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

*Plastic pollution hotspots: South Africa*
MISMANAGED WASTE AND LEAKAGE BY POLYMER [2018]

Uncollected + Improperly disposed + Leaked

Quality Score

1 2 3 4 5

45% 45% 44% 47% 36% 36% 48% 6% 4% 4% 3% 3% 4% 41% 35%

X% | Mismanaged Waste Index (MWI)
X% | Leakage Rate (LR)

Plastic pollution hotspots: South Africa
Plastic pollution hotspots: South Africa

POLYMER HOTSPOTS [2018]

Highest leakage contributors in absolute OR relative value:
- LDPE: 17 kt, leakage rate 4%
- PP and PET: 16 kt and 13 kt, leakage rate 4%
- Synthetic Rubber: 8 kt, leakage rate 6%

Micro-plastics from tyre abrasion are an important driver of leakage for this polymer.

Key take-aways:
- LDPE is the top contributor in absolute leakage (17 kt), with a leakage rate of 4%.
- PP and PET follow with 16 kt and 13 kt of leakage respectively. PET has a leakage rate of 4%.
- Although Synthetic Rubber ranks lower in absolute leakage (8 kt), it has the highest leakage rate with 6% of its generated waste leaks into the oceans and waterways. Micro-plastics from tyre abrasion are an important driver of leakage for this polymer.

Quality Score 2.0
PLASTIC POLLUTION HOTSPOTS: SOUTH AFRICA

Interpretation and Limitations

LDPE

LDPE is the top leaking polymer by absolute and relative leakage because almost 70% is used in the Packaging sector where products have a higher chance of leakage (release rate is 15% for packaging items in South Africa). 17 thousand tonnes of LDPE leaked into oceans and main rivers in 2018.

Learnings

PP

PP has a lower relative leakage rate than LDPE, but is very close in terms of absolute leakage with 16 thousand tonnes/year leaking into the marine environment. The main factor contributing to PP ranking second is that although PP waste generation is the same as LDPE (468 thousand tonnes), only half of this PP waste comes from the Packaging sector which has a higher release rate than most other sectors.

Learnings

PET

PET ranks third in absolute leakage but has second highest relative leakage (4%) with LDPE.

Learnings

PETCO announced 98,649 tonnes of PET bottles recycled in 2018 while Plastics SA announced only 74,328 tonnes of PET bottles recycled this same year. For data consistency across all polymers, we used values from Plastics SA (2019).

Limitations

Unlocking Limitations

Ensure alignment in recycling values reported or check if the difference between PETCO (2019) and Plastics SA (2019) values of PET bottles recycled is actually exported abroad for recycling.
POLYMER HOTSPOTS: INTERPRETATION AND LIMITATIONS

Synthetic rubber

From 8 kt of synthetic rubber leaked, 6 kt are due to micro-plastics from tyre abrasion leaking into waterways and only 2 kt come from mismanaged tyres.

- No production data was found for synthetic rubber. Thus we have set production to 0 by default but this most probably underestimates input quantities as well as waste generated for this polymer.
- We lack insights on how discarded tyres are managed throughout the country. According to DEA (2017), tyres are stockpiled over years at private depots or tyre retailers and do not really end up in landfills. By default, we distributed the overall waste management value (properly and improperly managed) proportionally to the share of tyre waste out of the total waste (after having discounted recycling and littering). Moreover, it is unclear whether some discarded tyres are recovered either through rethreading or incineration as it is the case in Kenya. As a result, reuse and circular practices are not captured in our analysis.

Gain insight on both primary production of synthetic rubber and waste management from the automotive tyre sector.

All polymers

- Sanitary landfills might not reach the standards we are expecting in South Africa, so the number of sanitary landfills used from SAWIC database might be too high, leading us to underestimate the share of waste mismanaged and leaked for all polymers.
- The stock assessment by polymer, as well as the proper and improper management of waste, are derived from the sector analysis through a sector to polymer mapping. This mapping is based on the EU market (from Plastics Europe, 2018).
- Improve SAWIC database consistency by aligning data reporting practices across the country as well as setting clear sanitary management standards to distinguish between fully and partially complying landfills.
- Building a sector to polymer mapping based on the South African market would improve the quality of the analysis.
APPLICATION HOTSPOTS
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

Criteria
- Raw data
- Reliability
- Modelling
- Geographic correlation
- Temporal correlation
- Granularity

Score
2.0
The application analysis covers 15% of total plastic waste (including 29% of waste from the packaging sector).
### Mismanaged Waste and Leakage by Application [2018]

<table>
<thead>
<tr>
<th>Application</th>
<th>Mismanaged Waste Index (MWI)</th>
<th>Leakage Rate (LR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncollected</td>
<td>4%</td>
<td>1%</td>
</tr>
<tr>
<td>Improperly disposed</td>
<td>29%</td>
<td>19%</td>
</tr>
<tr>
<td>Domestic waste</td>
<td>11%</td>
<td>12%</td>
</tr>
<tr>
<td>Mismanaged</td>
<td>26%</td>
<td>12%</td>
</tr>
</tbody>
</table>

Quality Score: 3.2

#### Plastic Pollution Hotspots: South Africa

- **Bottles-PET**: 24% mismanaged, 4% leaked, 1% improperly disposed, 4% uncollected.
- **Baby diapers**: 58% mismanaged, 11% leaked, 4% improperly disposed, 4% uncollected.
- **Food containers-PS**: 29% mismanaged, 4% leaked, 3% improperly disposed, 1% uncollected.
- **Trays-PET**: 29% mismanaged, 4% leaked, 3% improperly disposed, 1% uncollected.
- **Cigarette filters**: 63% mismanaged, 19% leaked, 12% improperly disposed, 8% uncollected.
- **Bags**: 30% mismanaged, 3% leaked, 11% improperly disposed, 8% uncollected.
- **Fishing nets**: 47% mismanaged, 12% leaked, 4% improperly disposed, 3% uncollected.
- **Sanitary towels**: 58% mismanaged, 11% leaked, 4% improperly disposed, 8% uncollected.
- **Trays-PS**: 29% mismanaged, 4% leaked, 12% improperly disposed, 8% uncollected.
- **Vending cups-PS**: 34% mismanaged, 8% leaked, 4% improperly disposed, 3% uncollected.
- **Snacks**: 30% mismanaged, 12% leaked, 4% improperly disposed, 3% uncollected.
- **Trays-PP**: 26% mismanaged, 6% leaked, 4% improperly disposed, 8% uncollected.
- **Cultery-PS/PP**: 32% mismanaged, 5% leaked, 5% improperly disposed, 8% uncollected.
- **Protective-**
- **Lids soft drinks**: 34% mismanaged, 8% leaked, 5% improperly disposed, 3% uncollected.
- **Straws**: 26% mismanaged, 7% leaked, 4% improperly disposed, 8% uncollected.
APPLICATION HOTSPOTS [2018]

- **Baby diapers** and **PS food containers** rank respectively 2nd (2.5 kt) and 3rd (1 kt) in absolute leakage.
- **Bottles - PET** are the top contributor in absolute leakage (8 kt), although it has one of the lowest leakage rate (4%).
- **Cigarette filters** rank lower in absolute leakage (1 kt), almost 1/5th of its waste generated tends to leak into the oceans.
- **Fishing nets** and **snacks** have a relatively high leakage rate (12% for both).

*The impact assessment uses beach clean-up data from Ryan, P.G. (2020) and Ocean Conservancy (2019)
APPLICATION HOTSPOTS: INTERPRETATION AND LIMITATIONS

All applications

- From various sources (PETCO, Plastix911, The Moss Group, SARS), we were able to derive a mass balance for only some detailed products (including food trays, snacks or straws), representing 15% of all plastic waste. Almost all plastic applications outlined in the graph are from the packaging sector, except for sanitary towels, baby diapers and cigarette filters categorised as “Other” sector and fishing nets included in the fishing sector. However, the packaging applications in the graph sum up to around 30% of the total plastic waste generated in the packaging sector, the remaining 70% being labelled as “other packaging” and including unknown products.

- The “other packaging” category of applications was not displayed to avoid important discrepancies in bar heights. However, the category of applications “other packaging” might include some critical applications that we are not aware of, and that could change our current perception of application hotspots.

Unlocking limitations

Engage collaborative research projects to close the gap on unknown products, especially from the Packaging sector. Collaboration with general and industrial retailers is advisable.

Bottles (PET)

On the basis of known products, PET bottles are the biggest hotspot in terms of absolute leakage. This can be explained by their large plastic waste input, representing 9% of all plastic waste on their own.

Unlocking limitations

Bottles made from other polymers do not appear in the analysis but is by default been included in “other packaging” that is not displayed as it would flatten all other applications on the bar chart.

Learnings

More detailed data on production of bottles made of other polymers than PET would allow to reach a complete picture for plastic bottles in South Africa.

Plastic bags

Plastic bags are not regarded as a hotspot in our analysis, which supports the fact that continuous efforts on plastic bags regulations paid off. However, plastic bags are regarded as especially harmful to marine wildlife and should still be monitored.

Unlocking limitations

Learnings

Plastic pollution hotspots: South Africa 40
SECTOR HOTSPOTS
OBJECTIVE AND INSTRUCTIONS

Key question answered:
Which sectors are most critical in the country regarding plastic leakage?

How to read the sector 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

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

* 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)
Plastic pollution hotspots: South Africa

Mass Balance by Sector [2018]

Quality Score

2.5

Input
- Short-lived products
- Long-lived products

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

Thousand tonnes
MISMANAGED WASTE AND LEAKAGE BY SECTOR [2018]

Quality Score

2.5

X% | Mismanaged Waste Index (MWI)
X% | Leakage Rate (LR)

Domestic waste
Improperly disposed
Uncollected
Leaked

Plastic pollution hotspots: South Africa
Plastic pollution hotspots: South Africa

SECTOR HOTSPOTS [2018]

The packaging sector contributes to almost 60% of the total plastic leakage with 46 kt of packaging waste leaking into oceans and waterways.

Fishing and medical sectors have a low contribution in absolute leakage but have high leakage rates (respectively 14% and 8%).

Automotive tyres are the 2nd highest contributor to plastic leakage in absolute value (8kt), especially due to microplastics from tyre abrasion.

Key take-aways:
- The packaging sector contributes to almost 60% of the total plastic leakage with 46 kt of packaging waste leaking into oceans and waterways.
- Automotive tyres are the 2nd highest contributor to plastic leakage in absolute value (8kt), especially due to microplastics from tyre abrasion.
- Fishing and medical sectors have a low contribution in absolute leakage but have high leakage rates (respectively 14% and 8%).
SECTOR HOTSPOTS: INTERPRETATION AND LIMITATIONS

Packaging

Packaging is the sector with the highest absolute leakage, higher than all other sectors combined, since packaging is the sector with the highest plastic consumption and, unlike other sectors, all of the products in the packaging sector are assumed to become waste within a year (no stock).

Automotive tyres

Tyres are responsible for 8 kt of plastic leakage, from which 6 kt are microplastics from tyre abrasion in use and 2 kt are released tyres from mismanaged waste.

As mentioned in the polymer hotspots for synthetic rubber, we lack insights on how discarded tyres are managed throughout the country.

Gain insight on waste management from the automotive tyre sector.

Construction

Construction is the third sector by absolute leakage (4 kt). Although plastic waste generated is lower than for automotive tyres, overall relative leakage is smaller because of a lower release rate with respect to packaging as well as a high share of plastic waste being stocked in buildings (thus not being discarded the same year).

Fishing

Fishing has a high relative leakage (14%), but a very low absolute leakage. The number of fishing vessels reported is low (Cefas, 2020) compared to other countries, although they are larger in size as fisheries in South Africa is mainly commercial. Gear loss and leakage is minor in the country and does not represent a critical sector hotspot. Some advanced measures are already taken to retrieve lost gears such as voluntary gear marking, but many recommendations from Cefas (2020) still need to be enforced in order to lower this high leakage rate.
Medical waste also has a high relative leakage and low absolute leakage.

The high relative leakage is most likely not accurate, as we do not assume that there is a special treatment of medical waste, as should be the case in most countries, with the majority of the medical waste being incinerated. We instead assume that medical waste is managed as normal waste, and we assume that because it is contaminated it has low value for recyclers. Despite our assumptions, a high relative leakage for medical waste could actually be possible due to poor medical waste management practices in all provinces of South Africa (Olaniyi et al., 2018). We are nonetheless confident that plastic medical waste is orders of magnitude lower than plastic packaging waste for instance, and as such less critical for what concerns plastic leakage.

Gain insight on waste management from the medical sector.
D REGIONAL HOTSPOTS
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/or 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**

**Key take-aways**

- Plastic waste generation is concentrated around Pretoria, Johannesburg, Durban and Cape Town areas where the population density is higher.
- On average, 18% of generated waste is plastic.

**Limitations**

Per capita waste generation and plastic share are estimated at a province level based on several studies. For some provinces, these values were only known for one or two municipalities. In that case, these values were used as a proxy for the other areas within the province. This most likely leads to an overestimate of plastic consumption in remote and rural areas.

**Learnings**

Waste generation is distributed according to the shares of population by income level in each province. This increases the quality of the results.

Gather information on per capita waste generation and waste characterisation for additional areas and archetypes in South Africa.

More details available in Appendices.
WASTE COLLECTION:
MAP AND INTERPRETATIONS

Key take-aways

- Waste collection effort is very effective in Gauteng and Western Cape provinces.
- Eastern cape has the lowest collection rate with 36%.

Although some provinces have high overall collection rates, there are significant discrepancies between rural and urban areas. On average in South Africa, less than 20% of waste is collected in rural areas while this share exceeds 80% in urban areas.
Key take-aways

- MWI is usually lower around big cities (around 20%) and can reach 70 to 80% in other areas.

Learnings

Because of the use of unsanitary landfills and dumpsites, a fifth of the waste collected is mismanaged, this together with the uncollected waste leads to relatively high MWI, especially outside urban areas.

Limitations

The distinction between sanitary and unsanitary landfills is based on the figures given by the SAWIC database. However, sanitary landfills in South Africa might not reach the standards we are expecting.

Unlocking limitations

Improve SAWIC database consistency by aligning data reporting practices across the country as well as setting clear sanitary management standards to distinguish between fully and partially complying landfills.

More details available in Appendices
REGIONAL LEAKAGE: MAP AND INTERPRETATIONS

Key take-aways

- Annual leakage of mismanaged waste: 71'801 tonnes.
- Annual leakage from mismanaged/lost at sea fishing gears and from overboard litter: 379 tonnes.

Learning

- Except for Gauteng, populated areas are usually located close to a waterway or the coast. This will increase the possibility of transfer to the marine environment.
- There is a leakage hotspot due to mismanaged/lost at sea fishing gear and overboard litter located on the west coast (234 tonnes/year), hosting 54% of the ports identified in the analysis.

More details available in Appendices
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)

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

<table>
<thead>
<tr>
<th>Waste management stage</th>
<th>Potential hotspot</th>
<th>Is it a hotspot?</th>
<th>Justification</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastic waste import</td>
<td>HOTSPOT</td>
<td>Only 7% of the waste rescued in the country is locally sourced, the remaining 93% is imported. The formal sector only requests imported waste (amount: 2.8%); a local and difficult to manage waste (e.g. MRF, VCO). Domestic waste is recycled by the informal sector in improper conditions.</td>
<td>WEI database and UCDU report VN_114-14</td>
<td></td>
</tr>
<tr>
<td>Plastic waste export</td>
<td></td>
<td></td>
<td></td>
<td>WEI database and UCDU report VN_114-14</td>
</tr>
</tbody>
</table>

For detailed element descriptions and methodology, refer to tool T4.1
### Key take-aways

- **Share of plastic in waste stream is high (18%).**
- **Waste separation at household level is low in many provinces.**
- **Slumping growth and international secondary market context drive recyclable plastic prices down, while plastics are still flooding the South African market.**
- **Lack of public waste bins, especially in low income areas (including informal settlements) drives littering behaviours.**
- **Extreme meteorological events are common in South Africa and drive plastic leakage.**
- **Some municipal sweeping teams push waste into drainage systems and waterways for the sake of simplicity. This increases the leakage and can lead to clogging and floods during extreme rain events.**

---

### WASTE MANAGEMENT HOTSPOTS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>WASTE SEGREGATION</td>
<td>Segregation of compostable waste</td>
<td>Segregation of recyclable plastics</td>
<td>Segregation by the informal sector</td>
<td>Public infrastructure availability</td>
<td></td>
</tr>
<tr>
<td>WASTE COLLECTION</td>
<td>Formal collection of municipal waste</td>
<td>Formal collection of industrial waste</td>
<td>Value of recycled plastics</td>
<td>Value of non-recycled plastics</td>
<td></td>
</tr>
<tr>
<td>LEAKAGE WHILE WAITING FOR COLLECTION</td>
<td>Design of waste bins</td>
<td>Frequency of collection</td>
<td>Climatic conditions</td>
<td>Other (e.g. animals)</td>
<td></td>
</tr>
<tr>
<td>WASTE RELATED BEHAVIOURS</td>
<td>Littering driven by cultural habits</td>
<td>Littering due to a lack of public waste bins</td>
<td>Frequency of fly-tipping</td>
<td>Frequency of illegal burning</td>
<td></td>
</tr>
<tr>
<td>WASTE MANAGEMENT INFRASTRUCTURE</td>
<td>Share of waste in dumpsites</td>
<td>Share of waste in unsanitary landfills</td>
<td>Informal recycling</td>
<td>Recycling capacity</td>
<td></td>
</tr>
<tr>
<td>POST-LEAKAGE MANAGEMENT</td>
<td>Frequency of city cleaning and sweeping</td>
<td>Frequency of waterway cleaning</td>
<td>Frequency of coastal clean-up</td>
<td>Frequency of other clean-up activities</td>
<td></td>
</tr>
<tr>
<td>WASTE WATER MANAGEMENT</td>
<td>Management of run-off waters</td>
<td>Waste water collection</td>
<td>Waste water treatment efficiency</td>
<td>Fate of WWTP sludges</td>
<td></td>
</tr>
</tbody>
</table>

*For more details and justifications, check tool T4.1*
PLASTIC WASTE JOURNEY IN PICTURES

1. Transfer Station
2. Waste Picker
3. Buy-back center (sorting and aggregation of recyclable waste)
4. Incineration and sanitary landfill
   Unsanitary landfill and dumpsite

Formal waste management
Informal collection and recycling

Plastic pollution hotspots: South Africa 57
Plastic pollution hotspots: South Africa

1. Transfer stations

2. Waste pickers on landfills

3. Buy back center

4. Unsanitary landfill
2.3 ACTIONABLE HOTSPOTS
### HOTSPOTS IN BRIEF

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

#### Application
- Bottles - PET
- Baby diapers
- Food containers - PS
- Fishing nets
- Snacks
- Cigarette filters
- Bags
- Sanitary towels
- Trays - PS
- Vending cups - PS

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

#### Regional

### Waste management

<table>
<thead>
<tr>
<th>Variable</th>
<th>Negative contribution to the leakage</th>
<th>Positive contribution</th>
<th>Neutral contribution</th>
<th>Not assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastic waste import</td>
<td>Plastic waste export</td>
<td>Plastic waste on-site generation</td>
<td>Share of plastic in waste streams</td>
<td>Public infrastructure availability</td>
</tr>
<tr>
<td>Waste disposal</td>
<td>Segregation of non-compostable waste</td>
<td>Segregation of recyclable plastics</td>
<td>Segregation by the informal sector</td>
<td>Value of recyclable plastics</td>
</tr>
<tr>
<td>Waste collection</td>
<td>Removal of waste from strategic areas</td>
<td>Formal collection of hazardous waste</td>
<td>Volume of recycled plastics</td>
<td>Value of recycled plastics</td>
</tr>
<tr>
<td>Leakage while waiting for collection</td>
<td>Damage of waste bins</td>
<td>Frequency of collection</td>
<td>Climate conditions</td>
<td>Other (e.g., animals)</td>
</tr>
<tr>
<td>Waste-related clean-ups</td>
<td>Lifting driven by cultural taboos</td>
<td>Lifting due to lack of public awareness</td>
<td>Frequency of floating</td>
<td>Frequency of illegal burning</td>
</tr>
<tr>
<td>Waste management infrastructure</td>
<td>Share of waste in deposits</td>
<td>Share of waste in temporary landfills</td>
<td>Informal recycling</td>
<td>Recycling capacity</td>
</tr>
<tr>
<td>Post LEAKAGE MANAGEMENT</td>
<td>Frequency of open burning and dumping</td>
<td>Frequency of incineration</td>
<td>Frequency of coastal clean-up</td>
<td>Frequency of other clean-up activities</td>
</tr>
<tr>
<td>Waste water management</td>
<td>Management of waste water</td>
<td>Waste water collection efficiency</td>
<td>Type of waste discharged</td>
<td>Type of waste sludge</td>
</tr>
</tbody>
</table>

- 3 highest leakage contributors in absolute OR relative value
- Highest leakage contributors in absolute AND relative value
### ACTIONABLE HOTSPOTS LIST

<table>
<thead>
<tr>
<th>#</th>
<th>ACTIONABLE HOTSPOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Plastic per capita waste generation in South Africa is above the world average and shows an increase in recent years.</td>
</tr>
<tr>
<td>2</td>
<td>The lack of re-use schemes or deposit scheme in South Africa contribute to a high consumption of single-use and on the go packaging.</td>
</tr>
<tr>
<td>3</td>
<td>PP is leaking because of high consumption in South Africa and lower recycling rate compared to other polymers such as LDPE or PET.</td>
</tr>
<tr>
<td>4</td>
<td>LDPE and PET are widely consumed polymers and could benefit from even higher recycling rate to reduce leakage.</td>
</tr>
<tr>
<td>5</td>
<td>Many different plastic packaging applications (including PET bottles) leak throughout the country due to very high use of plastic in the packaging sector.</td>
</tr>
<tr>
<td>6</td>
<td>Packaging is a key sector in South Africa that consumes important quantities of plastic.</td>
</tr>
<tr>
<td>7</td>
<td>The low demand for recycled material on the domestic market does not create enough incentive (market price) for the informal sector to increase collection.</td>
</tr>
<tr>
<td>8</td>
<td>Lack of waste segregation at source reduces the quality and quantity of recyclable waste.</td>
</tr>
<tr>
<td>9</td>
<td>All plastic leak in rural and peri-urban areas because of low collection rates (especially in informal settlements).</td>
</tr>
<tr>
<td>10</td>
<td>All plastic waste is prone to leakage while waiting for collection because of extreme meteorological events (wind / flooding).</td>
</tr>
<tr>
<td>11</td>
<td>A possibly higher proportion of dumpsites and unsanitary landfills than what officially recorded could increase waste mismanagement and eventually contribute to higher leakage rates in South Africa.</td>
</tr>
<tr>
<td>12</td>
<td>Tyres remain mismanaged in South Africa because of inefficacy of current regulations.</td>
</tr>
<tr>
<td>13</td>
<td>Absorbent hygiene products (including nappies and sanitary towels) have important relative leakage since no specific regulation on their proper disposal is in place.</td>
</tr>
<tr>
<td>14</td>
<td>Some applications, such as fishing nets, straws, lids and caps, trays and plastic bags, can have serious impact on marine wildlife, despite having a relatively small absolute leakage.</td>
</tr>
</tbody>
</table>

**GENERIC** (Concerns all plastic types and all regions)  **SPECIFIC** (Concerns specific plastic types and all regions)
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 South Africa calls for a well-balanced set of actions across the value chain, yet with an emphasis on the source (plastic production and imports) and the end-of-life.

**ACTIONABLE HOTSPOTS CHARACTERISATION**

**SOURCE**

1. 5
2. 4
3. 2
4. 7
5. 9
6. 10

**COLLECTION**

7. 8
8. 13
9. 11
10. 14

**END-OF-LIFE**

14. 12

- **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

<table>
<thead>
<tr>
<th>Actionable hotspots (AH)</th>
<th>AH 1</th>
<th>AH 2</th>
<th>AH 3</th>
<th>...</th>
<th>AH x</th>
</tr>
</thead>
</table>

### STEP 2: assess criteria levels for each chosen intervention

<table>
<thead>
<tr>
<th>Interventions (I)</th>
<th>Leakage mitigation potential*</th>
<th>Unintended consequences**</th>
</tr>
</thead>
<tbody>
<tr>
<td>I1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I2</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>I3</td>
<td>high</td>
<td>low</td>
</tr>
<tr>
<td>I4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I79</td>
<td>medium</td>
<td>high</td>
</tr>
<tr>
<td>I80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I82</td>
<td>high</td>
<td>medium</td>
</tr>
<tr>
<td>I83</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* **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).

### STEP 3: visualise priority interventions in the top right corner of the chart
PRELIMINARY SELECTION OF INTERVENTIONS

Prioritisation of interventions

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.

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

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

Learning

Limitations

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

<table>
<thead>
<tr>
<th>Interventions Classification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RE-DESIGN</td>
<td>SUSTAINABLE PRODUCTION</td>
</tr>
<tr>
<td>REDUCE</td>
<td>SUSTAINABLE CONSUMPTION AND LIFESTYLES</td>
</tr>
<tr>
<td>REUPERATE</td>
<td>WASTE COLLECTION SYSTEMS</td>
</tr>
<tr>
<td>RENOVATE</td>
<td>WASTE INFRASTRUCTURE</td>
</tr>
<tr>
<td>RECYCLE</td>
<td>PLASTIC RECYCLING</td>
</tr>
<tr>
<td>REMOVE</td>
<td>CLEAN-UP SOLUTIONS</td>
</tr>
</tbody>
</table>
### Preliminary Priority Interventions List

<table>
<thead>
<tr>
<th>Intervention Class</th>
<th>Priority Intervention</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainable Production</td>
<td>Avoid producing / importing plastic objects that do not benefit from a recycling solution in the country</td>
<td>I29</td>
</tr>
<tr>
<td></td>
<td>Promote design of material or process that favour reuse of plastic objects (e.g. deposit scheme)</td>
<td>I37</td>
</tr>
<tr>
<td>Sustainable Consumption</td>
<td>Reduce demand for, and use of, single-use, especially on-the-go, plastics</td>
<td>I19</td>
</tr>
<tr>
<td>Waste Collection Systems</td>
<td>Reduce the number of dumpsites and unsanitary landfills</td>
<td>I42</td>
</tr>
<tr>
<td></td>
<td>Plan more frequent waste collection prior to the rainy events</td>
<td>I45</td>
</tr>
<tr>
<td></td>
<td>Plan more frequent waste collection in areas prone to plastic leakage (taxi stations, informal settlements, …)</td>
<td>I46</td>
</tr>
<tr>
<td></td>
<td>Ensure plastic waste has a enough value to cover collection costs (for all polymers)</td>
<td>I59</td>
</tr>
<tr>
<td></td>
<td>Increase plastic segregation at household level</td>
<td>I48</td>
</tr>
<tr>
<td></td>
<td>Increase plastic segregation in public space (sorting waste bins)</td>
<td>I49</td>
</tr>
<tr>
<td></td>
<td>Ensure collection of discarded tyres</td>
<td>I57</td>
</tr>
<tr>
<td>Waste Infrastructure</td>
<td>Ensure proper use of existing sorting infrastructure</td>
<td>I79</td>
</tr>
<tr>
<td></td>
<td>Increase density of waste bins in rural areas</td>
<td>I81</td>
</tr>
<tr>
<td></td>
<td>Increase density of waste bins in specific areas prone to leakage</td>
<td>I83</td>
</tr>
<tr>
<td>Recycling</td>
<td>Increase recycling capacity for domestic plastic waste (PP)</td>
<td>I04</td>
</tr>
<tr>
<td></td>
<td>Increase recycling capacity for domestic plastic waste (PET, LDPE)</td>
<td>I05, I07</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Instruments (J)</th>
<th>Feasability*</th>
<th>Synergies**</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>J2</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>J3</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>J4</td>
<td>high</td>
<td>high</td>
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<tr>
<td>J5</td>
<td>medium</td>
<td>low</td>
</tr>
<tr>
<td>J79</td>
<td>medium</td>
<td>low</td>
</tr>
<tr>
<td>J80</td>
<td>medium</td>
<td>low</td>
</tr>
<tr>
<td>J81</td>
<td>low</td>
<td>medium</td>
</tr>
<tr>
<td>J82</td>
<td>high</td>
<td>medium</td>
</tr>
<tr>
<td>J83</td>
<td>high</td>
<td>medium</td>
</tr>
</tbody>
</table>

* 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.

**STEP 3:** visualise priority instruments in the top right corner of the chart
LIST OF POSSIBLE INSTRUMENT CATEGORIES

Knowledge creation
- Database
- Mapping
- Expertise
- Businesses
- Waste sector
- Partnership
- Structuration
- R&D
- Social
- Technology fisheries
- Technology microplastics
- Technology waste
- Incentive
- Informal sector
- Investment
- New business models
- Tax
- Ban
- Extended producer responsibility (EPR)
- Enforcement
- Industry regulation
- Municipality regulation
- Trade regulation
- Waste sector regulation
- Standardisation
- Monitoring

Awareness raising
- Citizens
- Waste sector
- Partnership
- Structuration
- R&D
- Social
- Technology fisheries
- Technology microplastics
- Technology waste
- Incentive
- Informal sector
- Investment
- New business models
- Tax
- Ban
- Extended producer responsibility (EPR)
- Enforcement
- Industry regulation
- Municipality regulation
- Trade regulation
- Waste sector regulation
- Standardisation
- Monitoring

Capacity building
- Partnership
- Structuration
- R&D
- Social
- Technology fisheries
- Technology microplastics
- Technology waste
- Incentive
- Informal sector
- Investment
- New business models
- Tax
- Ban
- Extended producer responsibility (EPR)
- Enforcement
- Industry regulation
- Municipality regulation
- Trade regulation
- Waste sector regulation
- Standardisation
- Monitoring

Innovation
- Technology waste
- Technology fisheries
- Technology microplastics
- Technology waste
- Incentive
- Informal sector
- Investment
- New business models
- Tax
- Ban
- Extended producer responsibility (EPR)
- Enforcement
- Industry regulation
- Municipality regulation
- Trade regulation
- Waste sector regulation
- Standardisation
- Monitoring

Economic
- Incentive
- Informal sector
- Investment
- New business models
- Tax
- Ban
- Extended producer responsibility (EPR)
- Enforcement
- Industry regulation
- Municipality regulation
- Trade regulation
- Waste sector regulation
- Standardisation
- Monitoring

Policy / Regulatory
- Enforcement
- Industry regulation
- Municipality regulation
- Trade regulation
- Waste sector regulation
- Standardisation
- Monitoring
APPENDICES
## COMPARISON WITH OTHER STUDIES

<table>
<thead>
<tr>
<th>Reports</th>
<th>Production and trade</th>
<th>Waste generation</th>
<th>Waste management</th>
<th>Leakage</th>
</tr>
</thead>
</table>
| **IUCN**  
National guidance for plastic pollution and shaping action | Production + Import = 3'637 kt  
Export = 1'084 kt  
Net input: 2'563 kt | Waste = 2'371 kt  
Imported waste = 18 kt | Recycled = 352 kt (+12 kt exported) [14%]  
Properly disposed = 1066 kt [45%]  
Improperly disposed = 243 kt [11%]  
Uncollected = 716 kt [30%] | Leakage = 79 kt |
| **H. von Blottnitz et al. 2019**  
South Africa beats Europe at plastics recycling, but also is a top 20 ocean polluter. Really? | Production = 840 kt  
+ 296 kt (recyclates)  
Import = 961 kt  
Export = 157 kt  
Net input: 1'940 kt | Waste = 1'533 kt  
Imported waste = unknown | Recycled + Exported = 333 kt [21%]  
Properly disposed = 352 kt [23%]  
Improperly disposed = 457 kt [30%]  
Uncollected = 381 kt [25%]  
Littered = 11 kt [1%] | Leakage = 7 kt  
Not assessed |
| **Verster et al. 2020**  
Land-based sources and pathways of marine plastics in a South African context | Production = 840 kt  
+ 296 kt (recyclates)  
Import = 961 kt  
Export = 157 kt  
Net input: 1'940 kt | Waste = 1'533 kt  
Import of waste = unknown  
Source: DEA (2017) | Recycled = 440 kt [40%]  
Properly disposed = the share of mismanaged waste is identical to IUCN study but the absolute is twice as low. Calculation is a rough top-down approach.  
Uncollected = 440 kt [40%]  
Littered = 11 kt [1%]  
Takes only the population near the coast (50 km buffer) as a source of leakage, which yields around 100 kt mismanaged plastic waste liable to leak. Then applies a 15-40% release rate from Jambeck 2015. | Leakage = 15 - 30 kt |
| **Jambeck et al. 2015**  
Plastic waste inputs from land into the ocean. | | | mismanaged = 630 kt  
Takes only the population near the coast (50 km buffer) | Leakage = 90 - 250 kt  
Uses between 15-40% release rate for coastal population while our release rate is at 8% for the whole country. |
The SAWIC database was suggesting that on average in 2018, 85% of collected waste (except recycled and exported) was properly disposed in engineered landfills or incinerated while only 15% were improperly disposed in non-engineered landfills. These shares seem very optimistic and stakeholders in South Africa suggested to complement the analysis with data from Von Blottnitz et al. (2019). Consequently, our results are adapted here by considering that 43% of collected waste (except recycled and exported) was properly disposed in engineered landfills or incinerated while 57% were improperly disposed in non-engineered landfills. This results in an alternative scenario where the mismanaged waste quantity increases as well the total plastic leakage. However, the alternative total plastic leakage value is in the same order of magnitude as the one from the report, and the hotspots by category in the detailed results remain unchanged.
4.1 DATA REPOSITORY
## Detailed Shares by Polymer

<table>
<thead>
<tr>
<th>Polymer Type</th>
<th>Waste produced in country</th>
<th>Domestic recycling of collected</th>
<th>Export of collected</th>
<th>Properly disposed</th>
<th>Improperly disposed</th>
<th>Uncollected</th>
<th>Tot</th>
<th>Collected</th>
<th>Mismanaged</th>
<th>Leaked</th>
<th>Waste produced and imported</th>
<th>Domestic recycling importd</th>
</tr>
</thead>
<tbody>
<tr>
<td>PET</td>
<td>314</td>
<td>22%</td>
<td>1%</td>
<td>41%</td>
<td>9%</td>
<td>27%</td>
<td>100%</td>
<td>73%</td>
<td>36%</td>
<td>4%</td>
<td>318</td>
<td>23%</td>
</tr>
<tr>
<td>PP</td>
<td>467</td>
<td>13%</td>
<td>0%</td>
<td>46%</td>
<td>10%</td>
<td>31%</td>
<td>100%</td>
<td>69%</td>
<td>41%</td>
<td>3%</td>
<td>471</td>
<td>13%</td>
</tr>
<tr>
<td>Polyester</td>
<td>161</td>
<td>0%</td>
<td>0%</td>
<td>56%</td>
<td>12%</td>
<td>31%</td>
<td>100%</td>
<td>69%</td>
<td>44%</td>
<td>2%</td>
<td>161</td>
<td>0%</td>
</tr>
<tr>
<td>LDPE</td>
<td>469</td>
<td>24%</td>
<td>1%</td>
<td>40%</td>
<td>9%</td>
<td>26%</td>
<td>100%</td>
<td>74%</td>
<td>35%</td>
<td>4%</td>
<td>475</td>
<td>25%</td>
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<tr>
<td>HDPE</td>
<td>241</td>
<td>25%</td>
<td>1%</td>
<td>39%</td>
<td>9%</td>
<td>27%</td>
<td>100%</td>
<td>73%</td>
<td>36%</td>
<td>3%</td>
<td>244</td>
<td>26%</td>
</tr>
<tr>
<td>PS</td>
<td>72</td>
<td>7%</td>
<td>0%</td>
<td>47%</td>
<td>11%</td>
<td>34%</td>
<td>100%</td>
<td>66%</td>
<td>45%</td>
<td>3%</td>
<td>73</td>
<td>8%</td>
</tr>
<tr>
<td>Other</td>
<td>286</td>
<td>2%</td>
<td>0%</td>
<td>53%</td>
<td>12%</td>
<td>33%</td>
<td>100%</td>
<td>67%</td>
<td>45%</td>
<td>2%</td>
<td>286</td>
<td>2%</td>
</tr>
<tr>
<td>Synthetic Rubber</td>
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<td>0%</td>
<td>0%</td>
<td>52%</td>
<td>12%</td>
<td>36%</td>
<td>100%</td>
<td>64%</td>
<td>48%</td>
<td>6%</td>
<td>131</td>
<td>0%</td>
</tr>
<tr>
<td>PVC</td>
<td>229</td>
<td>9%</td>
<td>0%</td>
<td>44%</td>
<td>11%</td>
<td>37%</td>
<td>100%</td>
<td>63%</td>
<td>47%</td>
<td>2%</td>
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<td>9%</td>
</tr>
<tr>
<td>Average</td>
<td>-</td>
<td>14%</td>
<td>0%</td>
<td>45%</td>
<td>10%</td>
<td>30%</td>
<td>100%</td>
<td>70%</td>
<td>40%</td>
<td>3%</td>
<td>265</td>
<td>15%</td>
</tr>
</tbody>
</table>

- **Waste** = Collected + Uncollected
- **Collected** = Domestic recycling of collected + Export of collected + Properly managed + Improperly managed
- **Mismanaged** = Improperly managed + Uncollected
### Waste Management by Province

<table>
<thead>
<tr>
<th>Province</th>
<th>Population 2020</th>
<th>Generated t</th>
<th>Collected t</th>
<th>Properly disposed &amp; collected for recycling t</th>
<th>Improperly disposed t</th>
<th>Uncollected t</th>
<th>Mismanaged t</th>
<th>Leaked t</th>
<th>Generated kg/cap</th>
<th>Collected kg/cap</th>
<th>Mismanaged kg/cap</th>
<th>Share of Collected</th>
<th>Share of Mismanaged</th>
<th>Leakage rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Cape (rural)</td>
<td>3 433 703</td>
<td>167 286</td>
<td>836</td>
<td>686</td>
<td>151</td>
<td>166 449</td>
<td>166 600</td>
<td>15 268</td>
<td>49</td>
<td>0</td>
<td>49</td>
<td>100%</td>
<td>1%</td>
<td>9%</td>
</tr>
<tr>
<td>Eastern Cape (urban)</td>
<td>3 319 103</td>
<td>161 703</td>
<td>117 720</td>
<td>101 954</td>
<td>15 765</td>
<td>43 983</td>
<td>59 748</td>
<td>4 254</td>
<td>49</td>
<td>35</td>
<td>18</td>
<td>73%</td>
<td>37%</td>
<td>3%</td>
</tr>
<tr>
<td>Free State (rural)</td>
<td>235 814</td>
<td>7 872</td>
<td>394</td>
<td>366</td>
<td>27</td>
<td>7 478</td>
<td>7 506</td>
<td>733</td>
<td>33</td>
<td>2</td>
<td>32</td>
<td>5%</td>
<td>95%</td>
<td>9%</td>
</tr>
<tr>
<td>Free State (urban)</td>
<td>2 530 121</td>
<td>84 461</td>
<td>76 353</td>
<td>71 172</td>
<td>5 181</td>
<td>8 108</td>
<td>13 289</td>
<td>1 310</td>
<td>33</td>
<td>30</td>
<td>5</td>
<td>90%</td>
<td>16%</td>
<td>2%</td>
</tr>
<tr>
<td>Gauteng (rural)</td>
<td>386 278</td>
<td>19 411</td>
<td>6 134</td>
<td>5 303</td>
<td>831</td>
<td>13 277</td>
<td>14 108</td>
<td>843</td>
<td>50</td>
<td>16</td>
<td>37</td>
<td>32%</td>
<td>73%</td>
<td>4%</td>
</tr>
<tr>
<td>Gauteng (urban)</td>
<td>14 336 163</td>
<td>720 402</td>
<td>664 931</td>
<td>599 912</td>
<td>65 019</td>
<td>55 471</td>
<td>120 490</td>
<td>8 850</td>
<td>50</td>
<td>46</td>
<td>8</td>
<td>92%</td>
<td>17%</td>
<td>1%</td>
</tr>
<tr>
<td>KwaZulu-Natal (rural)</td>
<td>4 305 262</td>
<td>138 482</td>
<td>5 539</td>
<td>5 197</td>
<td>342</td>
<td>132 943</td>
<td>133 285</td>
<td>11 437</td>
<td>32</td>
<td>1</td>
<td>31</td>
<td>4%</td>
<td>96%</td>
<td>8%</td>
</tr>
<tr>
<td>KwaZulu-Natal (urban)</td>
<td>6 677 966</td>
<td>214 802</td>
<td>152 509</td>
<td>147 490</td>
<td>5 019</td>
<td>62 292</td>
<td>67 311</td>
<td>6 364</td>
<td>32</td>
<td>23</td>
<td>10</td>
<td>71%</td>
<td>31%</td>
<td>3%</td>
</tr>
<tr>
<td>Limpopo (rural)</td>
<td>3 237 780</td>
<td>60 379</td>
<td>3 744</td>
<td>2 319</td>
<td>1 425</td>
<td>56 636</td>
<td>58 060</td>
<td>2 927</td>
<td>19</td>
<td>1</td>
<td>18</td>
<td>6%</td>
<td>96%</td>
<td>5%</td>
</tr>
<tr>
<td>Limpopo (urban)</td>
<td>2 807 396</td>
<td>52 353</td>
<td>44 134</td>
<td>28 855</td>
<td>15 279</td>
<td>8 219</td>
<td>23 498</td>
<td>1 181</td>
<td>19</td>
<td>16</td>
<td>8</td>
<td>84%</td>
<td>45%</td>
<td>2%</td>
</tr>
<tr>
<td>Mpumalanga (rural)</td>
<td>1 103 118</td>
<td>47 582</td>
<td>6 424</td>
<td>6 165</td>
<td>259</td>
<td>41 158</td>
<td>41 417</td>
<td>2 686</td>
<td>43</td>
<td>6</td>
<td>38</td>
<td>14%</td>
<td>87%</td>
<td>6%</td>
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<tr>
<td>Mpumalanga (urban)</td>
<td>3 643 454</td>
<td>157 156</td>
<td>131 540</td>
<td>126 368</td>
<td>5 172</td>
<td>25 616</td>
<td>30 788</td>
<td>1 893</td>
<td>43</td>
<td>36</td>
<td>8</td>
<td>84%</td>
<td>20%</td>
<td>1%</td>
</tr>
<tr>
<td>North West (rural)</td>
<td>1 805 540</td>
<td>60 782</td>
<td>16 776</td>
<td>7 745</td>
<td>9 031</td>
<td>44 006</td>
<td>53 037</td>
<td>2 918</td>
<td>34</td>
<td>9</td>
<td>29</td>
<td>28%</td>
<td>87%</td>
<td>5%</td>
</tr>
<tr>
<td>North West (urban)</td>
<td>3 264 468</td>
<td>109 895</td>
<td>96 488</td>
<td>49 754</td>
<td>46 734</td>
<td>13 407</td>
<td>60 142</td>
<td>3 272</td>
<td>34</td>
<td>30</td>
<td>18</td>
<td>88%</td>
<td>55%</td>
<td>3%</td>
</tr>
<tr>
<td>Northern Cape (rural)</td>
<td>187 612</td>
<td>7 601</td>
<td>2 022</td>
<td>370</td>
<td>1 651</td>
<td>5 579</td>
<td>7 230</td>
<td>694</td>
<td>41</td>
<td>11</td>
<td>39</td>
<td>27%</td>
<td>95%</td>
<td>9%</td>
</tr>
<tr>
<td>Northern Cape (urban)</td>
<td>932 333</td>
<td>37 771</td>
<td>33 087</td>
<td>6 663</td>
<td>26 425</td>
<td>4 684</td>
<td>31 109</td>
<td>2 790</td>
<td>41</td>
<td>35</td>
<td>33</td>
<td>88%</td>
<td>82%</td>
<td>7%</td>
</tr>
<tr>
<td>Western Cape (rural)</td>
<td>600 494</td>
<td>26 827</td>
<td>9 068</td>
<td>7 483</td>
<td>1 586</td>
<td>17 759</td>
<td>19 344</td>
<td>1 048</td>
<td>45</td>
<td>15</td>
<td>32</td>
<td>34%</td>
<td>72%</td>
<td>4%</td>
</tr>
<tr>
<td>Western Cape (urban)</td>
<td>6 621 041</td>
<td>295 794</td>
<td>287 512</td>
<td>244 234</td>
<td>43 278</td>
<td>8 282</td>
<td>51 560</td>
<td>3 334</td>
<td>45</td>
<td>43</td>
<td>8</td>
<td>97%</td>
<td>17%</td>
<td>1%</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>Raw data</th>
<th>Modelling</th>
<th>Final metric</th>
<th>Score</th>
<th>Quality Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reliability</strong></td>
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<td><strong>Geographic</strong></td>
<td><strong>Granularity</strong></td>
<td><strong>Import of waste</strong></td>
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<td>Import of waste</td>
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<td></td>
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<tr>
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<tr>
<td>ICIS, 2020</td>
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<td>For products for which the polymer is not specified: PlasticsEurope matrix used to assign polymer based on sector.</td>
<td>2018</td>
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<td>See Comtrade Flowchart</td>
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<tr>
<td>UN, 2020, COMTRADE database*</td>
<td>2018</td>
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<td>PlasticsEurope, 2018</td>
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<td>For products for which the polymer is not specified: PlasticsEurope matrix used to assign polymer based on sector.</td>
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<td>See Comtrade Flowchart</td>
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<tr>
<td>ICIS, 2020</td>
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<tr>
<td>Production for synthetic rubber is missing and was arbitrarily set to 0.</td>
<td>2018</td>
<td>-</td>
<td>1</td>
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<tr>
<td>UN, 2020, COMTRADE database*</td>
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<tr>
<td>ICIS, 2020</td>
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<tr>
<td>Production for synthetic rubber is missing and was arbitrarily set to 0.</td>
<td>2018</td>
<td>-</td>
<td>1</td>
<td>2</td>
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</tbody>
</table>
| * Data as reported by South Africa to UN. ** Net input = Import waste - Recycling of imported waste + 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)

<table>
<thead>
<tr>
<th>Raw data</th>
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<td>Total export of plastic waste</td>
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<td>Domestic recycling of collected waste***</td>
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**Reliability**

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**Final metric**

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<td>Domestic recycling of collected waste***</td>
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<td>Properly disposed</td>
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<td>See Polymer Flowchart</td>
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<tr>
<td>Improperly disposed</td>
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<td>See Polymer Flowchart</td>
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<td>Uncollected</td>
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<td>See Polymer Flowchart</td>
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<tr>
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<td>See Polymer Flowchart</td>
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<td>2.5</td>
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</table>

* Data as reported by South Africa to UN
*** “Recycling of imported waste” together with “recycling of domestic waste” constitute the country’s “recycling” bar

**Notes:**

- Properly disposed waste by sector is specific to ZAF.
- Improperly disposed waste by sector is specific to ZAF.

**Mapping from sector to polymer based on EU, but adapted to ZAF “remaining after recycling” metric by polymer. Properly disposed waste by sector is specific to ZAF.

**Mapping from sector to polymer based on EU, but adapted using ZAF “mismanaged” waste. Properly disposed waste by sector is specific to ZAF.**

**Mapping from sector to polymer based on EU market.**

**Data as reported by South Africa to UN.**

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Plastics Europe, 2018 | Sector to polymer mapping based on EU market | 1 | 2018 | Export of waste |

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Plastics SA, 2019 | Some formal recyclers recycle imported waste | 1 | 2018 | Properly disposed per sector |

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This study - Sector | Properly disposed per sector | 2.5 | 2018 | Properly disposed per sector |

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This study - Sector | Improperly disposed by sector | 2.5 | 2018 | Improperly disposed by sector |

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This study - Sector | Leakage by sector | 2.5 | 2018 | Leakage by sector |

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This study - Polymer | Remaining after recycling and property managed | 1.8 | 2018 | Remaining after recycling and property managed |

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This study - Polymer | Remaining after recycling - Export of waste - Domestic recycling - Property disposed - Improperly disposed | 1.8 | 2018 | Remaining after recycling - Export of waste - Domestic recycling - Property disposed - Improperly disposed |

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This study - Polymer | Remaining after recycling - Export of waste - Domestic recycling - Unmanaged waste by polymer | 1.5 | 2018 | Remaining after recycling - Export of waste - Domestic recycling - Unmanaged waste by polymer |

---

* Data as reported by South Africa to UN
*** “Recycling of imported waste” together with “recycling of domestic waste” constitute the country’s “recycling” bar

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**Plastic pollution hotspots: South Africa 80**
APPLICATION HOTSPOTS
DATA QUALITY ASSESSMENT (1/2)

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<td>Geographic</td>
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</table>

**Quality Score: 3.2**

**Data as reported by South Africa to UN**

*For some packaging applications: Production = Waste + Export - Import. Waste = Waste from Packaging and Tourism * Share of import/export by application. Applications displayed only cover a fraction of total waste while many applications remain unknown.*
**APPLICATION HOTSPOTS**

**DATA QUALITY ASSESSMENT (2/2)**

### Raw data

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<tr>
<td>3.2</td>
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<td>Domestic recycling by application as defined as proportional to the waste generated by default. Except for PET bottles for which recycling value was available.</td>
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<tr>
<td>PETCO, 2019</td>
<td>Recycling for PET bottles.</td>
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<td>3.2</td>
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<td>Plastics SA, 2019</td>
<td>Some formal recyclers recycle imported waste</td>
<td>Domestic recycling of collected waste***</td>
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<td>3.2</td>
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<tr>
<td>This study - Sector</td>
<td>Properly disposed per Packaging and Tourism sector</td>
<td>Properly disposed</td>
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<td>3.2</td>
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<tr>
<td>This study - Application</td>
<td>Remaining after recycling = Waste - Export of waste - Recycling of domestic</td>
<td>Improperly disposed</td>
<td>1.9</td>
<td>3.2</td>
</tr>
<tr>
<td>European Commission, 2018</td>
<td>Plastic packaging application littering rate</td>
<td>Littering rate is estimated following EU Commission study. For application in packaging we follow the application flowchart. For the other applications see additional notes.</td>
<td>2.8</td>
<td>3.2</td>
</tr>
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<td>This study - Sector</td>
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<td>3.2</td>
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<td>For packaging applications: See Application flowchart. For other applications: See additional notes.</td>
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<td>3.2</td>
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<td>Waste - Export of waste - Domestic recycling</td>
<td>Uncollected = Waste - Export of waste - Domestic recycling - Properly disposed - Improperly disposed</td>
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<td>3.2</td>
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<td>2.5</td>
<td>3.2</td>
</tr>
</tbody>
</table>

* Data as reported by South Africa to UN

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

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*Plastic pollution hotspots: South Africa*
Cigarette filters: Cigarette filters: We estimate the number of cigarette filters from cigarette consumption data (https://www.iol.co.za/the-star/about-8-million-adults-in-sa-smoke-27-billion-cigarettes-a-year-9429417). 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 (see sector hotspots calculation sheets), applied to the cigarette filters that are not littered. Littering rate is set to 29%, based on EU littering report. The improperly managed is based on the average share of improperly managed (see ibid), applied to cigarette filters not littered or properly managed. The release rate for cigarette filters (small low value item) is 31%, we reduce it for South Africa to 19% based on the average reduction of release rate due to geographical conditions. Release rate is applied to uncollected and improperly managed to determine the total leakage.

Sanitary towels: Sanitary towels: Waste generation is estimated to be 3 sanitary towels/day, 5 days/month, 12 month/year for the female population from 15 to 55 years old with a middle or high income level. One sanitary towel weighs 2 grams. Recycling is set to zero. The share of properly managed is taken from the average share of properly managed (see sector hotspots calculation sheets), applied to the sanitary towels that are not littered. Littering rate is set to 21%, based on EU littering report. The improperly managed is based on the average share of improperly managed (see ibid), applied to sanitary towels not littered or properly managed. The release rate for sanitary towels (medium low value item) from PLP is 25%, we reduce it for South Africa to 19% based on the average reduction of release rate due to geographical conditions. Release rate is applied to uncollected and improperly managed to determine the total leakage.

Baby diapers: Baby diapers: To determine the waste generation we consider that the middle and high income population (55%) from 0-2 years old (half of the 0-4 pop in UN statistics database), uses 4.16 unit of diapers/day (Mendosa et al., 2018). Average weight of a baby diaper is 29.1 grams, from which 33% is made of plastic components (Espinosa et al. 2015). Recycling is set to zero. The share of properly managed is taken from the average share of properly managed (sector hotspot), applied to the baby diapers that are not littered. Littering rate is set to 21%, based on EU littering report (using sanitary towels as a proxy). The improperly managed is based on the average share of improperly managed (sector hotspot), applied to baby diapers not littered or properly managed. The release rate for baby diapers is the same as for sanitary towels. Release rate is applied to uncollected and improperly managed to determine the total leakage.
## Sector Hotspots

### Data Quality Assessment (1/2)

<table>
<thead>
<tr>
<th>Raw data</th>
<th>Modelling</th>
<th>Final metric</th>
<th>Score</th>
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<tr>
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<tr>
<td></td>
<td>Granularity</td>
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</table>

### Sources

1. **Short-lived products**
   - Geyer et al., 2017 | Product lifetime by sector, mean and std.
   - This study – Polymer | Net input by polymer* 2

2. **Long-lived products**
   - The World Bank, 2012 | Manufacturing, added value, GDP growth
   - Geyer et al., 2017 | Product lifetime by sector, mean and std.
   - This study – Sector | Net input* by sector 2

3. **Change in stock**
   - 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 2.5

* sources: GCIS (2014); Cefas (2020)

** sources: Nemathaga, F. et al. (2008); Olaniyi, F. et al. (2018)


For net input quantity see Sector hotspot flowchart for all sector except for fishing* and tourism**, fishing 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.

Plastic pollution hotspots: South Africa 84
### SECTOR HOTSPOTS
### DATA QUALITY ASSESSMENT (2/2)

#### Raw data

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<td>This Study - Polymer</td>
<td>Export of waste and domestic recycling of collected by polymer</td>
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<td>Polymer to sector mapping based on EU market</td>
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<td>Non-recycled waste - Export of waste - Properly disposed</td>
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<td>Plastic Leak Project, 2018</td>
<td>Littering rate by sector (based on product size and type of usage)</td>
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<td>This study - Sector</td>
<td>Micro-leakage by sector (see additional notes)</td>
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<td>Waste</td>
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<td>Waste - Export of waste - Domestic recycling - Improperly disposed</td>
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<td>Plastic Leak Project, 2018</td>
<td>Release rate by sector (based on product size and value for informal recyclers)</td>
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<td>Total Macro-leakage</td>
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<td>This study - Sector</td>
<td>Micro-leakage</td>
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**Net input = Export of waste - Recycling of import + Impact of products - Export of primary end products + Import and production of primary.**

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

#### Quality Score

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2.5

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Plastic pollution hotspots: South Africa 85
**SECTOR HOTSPOTS MODELLING NOTES (1/2)**

**Fishing:** See details in regional hotspots modelling notes.

**Medical:** Total plastic waste generated by the medical sector is computed by combining the number of hospital beds (Nemathaga et al. 2008, 2.8 beds per 1'000 capita), the average bed occupancy rate, the total waste generated by bed and the average plastic share in medical waste (Nemathaga et al. 2008). No distinction was made infectious and non-infectious medical waste. In South Africa there is informal medical sector that operates outside of hospitals which we do not capture. Nonetheless, plastic waste from the medical sector significantly smaller than plastic waste from the packaging sector, thus not a hotspot in the country. (Quality Score = 2.5, as the average occupancy rate is from a default value and insight into informal sector is missing)

**Tourism:** Data on number of tourists and average length of stay comes from the Tourism report 2018, STATS SA. We combine this information with the average country plastic waste generation per capita per day derived from our calculations, in order to estimate the plastic waste generated by the tourism sector. We make the assumption that a tourist will generate as much plastic waste as an average South African citizen. (Quality score = 3, as tourist could generate more plastic waste than the average citizen).

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

- **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 vehicles numbers are taken from *eNATIS (2017)* and average distance travelled are based on *Stone et al. (2018)*.

- **Textile fibres**: loss and leakage of textile fibres to the marine environment is calculated based on the methodology described in *PLP (2019)*. Its contribution to leakage is included in "Textiles".

- **Cosmetics**: loss and leakage of plastic micro-particles from cosmetics to the marine environment is calculated based on the methodology described in *PLP (2019)*. Its contribution to leakage is included in "Others".

- **Pellets**: loss and leakage the marine environment of plastic pellets during transportation and production stages is calculated based on the methodology described in *PLP (2019)*. Its contribution to leakage is included in "Others".
## Plastic pollution hotspots: South Africa

### Data Quality Assessment (1/2)

**Quality Score**: 2.3

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<td>Total plastic waste generated</td>
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<td>AS/ON, 2018</td>
<td>NASA population count on 1km² grid</td>
<td>Uncollected</td>
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<td>Green Cape, 2020</td>
<td>Plastic recyclers by province</td>
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<td>Plastics SA, 2019</td>
<td>Total plastic recycled in South Africa</td>
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<td><strong>Granularity</strong></td>
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<tr>
<td>Heti &amp; Thara, 2018</td>
<td>Collection rate by province</td>
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<td>MSWIC, 2020</td>
<td>Share between sanitary and septic sanitary landfill</td>
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<tr>
<td>AS/ON, 2018</td>
<td>NASA population count on 1km² grid</td>
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<td>Green Cape, 2020</td>
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<tr>
<td>Plastics SA, 2019</td>
<td>Total plastic recycled in South Africa</td>
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<td>Association of Waste &amp; Recycling Management &amp; Waste Advisory Group, 2016</td>
<td>Per capita waste generation rate</td>
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<tr>
<td>Heti &amp; Thara, 2018</td>
<td>Collection rate by province</td>
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<tr>
<td>MSWIC, 2020</td>
<td>Share between sanitary and septic sanitary landfill</td>
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<td>This Study - Regional</td>
<td>Waste - Collected for recycling - Properly disposed - Improperly disposed (by province)</td>
<td>2015-2018</td>
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### Modelling

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### Final Metric

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### Quality Score

- **Quality Score**: 2.3
- **Score Range**: 1 (least reliable) to 5 (most reliable)
### REGIONAL HOTSPOTS

#### DATA QUALITY ASSESSMENT (2/2)

<table>
<thead>
<tr>
<th>Raw data</th>
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<td><strong>Geographic</strong></td>
<td><strong>Granularity</strong></td>
<td><strong>Share of Mismanaged</strong></td>
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<tr>
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<td>1.82</td>
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</table>

- **This Study - Regional**: Mismanaged = Uncollected + Improperly managed by province
- **This Study - Regional**: Waste generated by province
- **This Study - Regional**: Collected = Collected for recycling + Properly disposed + Improperly disposed

**Share of collected = Waste mismanaged by province / waste generated by province**

**Share of Mismanaged = Uncollected + Improperly managed by province / waste generated by province**

**Leakage from fishing sector**

**Macro-leakage from land**

*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)
Fishing:

Leakage from lost/mismanaged fishing gear & overboard litter is estimated in three distinct zones of the South African coastline (west, south and east coasts) and includes three parameters:

1) Direct loss of fishing gear at sea: based on the number of vessels per fishing gear (e.g. demersal trawl), registered in each port of each zone (Cefas, 2020). The raw unit loss per type of gear is derived from Richardson et al., (2019). By default plastic weights by fishing gear type were derived from technical designs found in multiple publications: Nédélec et al. (1990), Prado (1990), Boopendranath, M. (2012) and Kishan, W. et al. (2018) and Queirolo, D. et al. (2009). Combining these pieces of information yields the net plastic input from fishing gears as well their plastic leakage.

2) Leakage from overboard littering by fishermen: is calculated based on the number of fishermen in the country, their average number of days spent at sea (120 days) and the amount of packaging littered in the country based on Tool T3 and doubled for fishermen.

3) Leakage from mismanaged fishing gear on land: results from the application of Tool T3 to total plastic in fishing gears in use, defined as 10 times higher than direct loss at sea (based on average ratio between direct loss at sea and fishing gear net input found for other pilot countries).
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Country report

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