# A solution package for plastic pollution – from measurement to action

## Insights from Eastern and Southern Africa, Southeast Asia, and the Mediterranean

Edited by Lynn Sorrentino

INTERNATIONAL UNION FOR CONSERVATION OF NATURE

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IUCN is pleased to acknowledge the support of its Framework Partners who provide core funding: Ministry of Foreign Affairs of Denmark; Ministry for Foreign Affairs of Finland; Government of France and the French Development Agency (AFD); the Ministry of Environment, Republic of Korea; the Norwegian Agency for Development Cooperation (Norad); the Swedish International Development Cooperation Agency (Sida); the Swiss Agency for Development and Cooperation (SDC) and the United States Department of State.

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# Foreword


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Close to 400 million tonnes of plastic are produced annually, and with the energy-intensive processes required to extract and distil oil, the production of plastic generates enormous amounts of greenhouse gas (GHG) emissions, exacerbating the global climate crisis. Once produced, many plastics are never used again. Given the non-existent or weak infrastructure for managing plastic waste, inclusive, multistakeholder approaches must be taken to stem the flow of plastic pollution into rivers and the ocean. There is an urgent need for a set of harmonised methodologies and tools to measure plastic waste and pollution. These must be combined with economic and regulatory approaches to produce real change in the fight to keep the marine environment clean and to safeguard marine biodiversity.

Our global ocean, coastlines and rivers suffer from the presence of an immense volume of plastic where it does not belong, a result of the malfunctioning, take-make-dispose economy. Plastic is ubiquitous. Its negative impacts as a pollutant on marine and coastal ecosystems are well documented and there is growing evidence of the harm it does to human health. IUCN is working closely with governments, industry, and civil society to reduce and control plastic pollution through its global Close the Plastic Tap programme[1].

The methodology used in this research is one of more than thirty that have emerged in the past years. As plastic pollution research continues, there is a clear need for harmonised and interoperable methodologies to ensure that results are actionable and useful for policy makers and other stakeholders. The results presented here build upon previous research by IUCN and others but much more primary research is needed.

This publication is a summary of several research pieces encompassing a holistic model to eliminate plastic pollution. It aims to link the results from the application of the UNEP/IUCN *National Guidance for Plastic Pollution Hotspotting and Shaping Action* (UNEP/IUCN, 2020) to policy and economic research, to share how IUCN created enabling environments for action, and to provide an overview of tools, methods, and interventions to guide decision makers.

The goal of this report is to inspire action that will reduce, and possibly eliminate, plastic pollution. There are four objectives: **1)** draw conclusions from the results of eight plastic pollution hotspotting assessments; **2)** recommend actions, instruments, and interventions; **3)** discuss the findings and recommendations of policy and economic research; and **4)** share the methodologies, with the aim that others can replicate the model.

The social, environmental, and economic impacts of plastic pollution demand that we act to ensure the future health of the ocean. From local to global, plastic pollution solutions for a healthy ocean are available, and some of these are presented here for consideration. The news of 2 March 2022 of the endorsement by 175 countries of the UN Environment Assembly Resolution, "End plastic pollution: Towards an international legally binding instrument" generated new hope in the global fight against plastic pollution.

1 For more information: https://www.iucn.org/theme/marine-and-polar/our-work/close-plastic-tap-programme

# Executive summary

Knowledge gathered over the past four years in the IUCN Close the Plastic Tap programme is the basis of this publication. It presents a summary of methodologies, results, and key lessons learned from the use of the UNEP/IUCN (2020) *National Guidance for Plastic Pollution Hotspotting and Shaping Action* in Kenya, Menorca (Spain), Mozambique, Republic of Cyprus, South Africa, Thailand, United Republic of Tanzania, and Viet Nam.

The key takeaway from this research is that there is a pressing need to use **science-based plastic leakage assessments to drive policy and behavioural changes that will reduce plastic pollution**. Furthermore, IUCN's comprehensive methodology and tools **provide a holistic package to build capacity for stakeholders to understand and manage marine plastic pollution.**

Included in the publication are:

- An overview of plastic pollution hotspots, priority areas for intervention, and instruments to implement the interventions to stop plastic pollution;
- Policy and economic analyses demonstrating the development of appropriate legal and regulatory frameworks that complement the hotspot knowledge, contributing to a comprehensive suite of approaches that are needed to effectively address plastic pollution; and
- An integrated methodology to solve the issue of plastic leaking into the environment: steps to begin a plastic pollution assessment, who to involve, and how to link results to policies, including economic policies.

## Summary of findings

Eight pilot hotspotting assessments highlight which plastic polymers are leaking into the marine environment, which sectors and plastic applications contribute the most to this leakage, and waste management practices that are either positive, neutral, or negative contributors to plastic pollution in the eight locations.

The results of the eight assessments showed that, on average, Thailand and Viet Nam produce ten times more plastic leakage than Kenya, and five times more than South Africa. Kenya and South Africa are the two largest contributors to plastic leakage among the pilot sites in Africa. Absolute plastic leakage from the Mediterranean islands is 100 to 1,000 times less than that of the pilot countries in Africa and Asia. The low leakage of these small islands can be explained not only by their low populations but also by their more efficient waste management systems. The assessment of waste management across the pilot sites showed that low collection rates, burning of waste, and general waste mismanagement all contributed to plastic leaking to the ocean.

LDPE, PET and PP are extensively used in the packaging sector, and they are consumed in large quantities across every region, with packaging making up 45% of total plastic consumption worldwide (Geyer et al., 2017). Due to their ubiquitous use in packaging applications, these polymers are more likely than others to be littered or mismanaged. They eventually leak into waterways and the ocean.

The density of plastic leakage is much higher in urban areas than in rural ones, yet rural areas are also responsible for plastic pollution of waterways. For all pilot sites, leakage density (leakage per $km^2$) in waterside communities was higher than for inland areas, and leakage

density was higher along the waterside because of the proximity to water.

Additional technical details and analysis are available in the IUCN regional results publication, *Plastic Pollution Hotspotting and Shaping Action Regional Results from Eastern and Southern Africa, the Mediterranean, and Southeast Asia* (Pucino et al., 2020).

Importantly, the plastic pollution hotspotting findings are linked to practical interventions for the eight pilot locations. Linking the results to the way to address the issues is the innovative, integrated approach provided by IUCN. These linkages have produced a set of recommendations for each location studied – ensuring that tackling plastic pollution is more than beach clean-ups, more waste bins, and national plastic bag bans.

## Types of recommendations

This publication suggests a set of recommended actions that should be taken as part of a package of work that tackles plastic pollution from several angles. The recommendations include global needs, actionable hotspots, national and regional interventions, economic suggestions on knowledge uptake, the role of extended producer responsibility (EPR) and deposit return schemes (DRS), and circular economy. Recommendations on harmonising hotspotting methodologies and a synthesis of lessons learned and actions to take are also included.

Recommendations are broad but can be nationally tailored. The recommendations shared include moving toward a circular economy for plastics, specific business stakeholder recommendations, sets of specific action, how extended producer responsibility and deposit refund schemes fit into this holistic package, and why a global plastic pollution treaty is needed, and as of 2 March 2022, an international legally binding agreement will be in place by 2024. The set of tools and approaches detailed in the report is designed to allow decision makers to set up and begin a long-term, cost-effective programme to stop plastic pollution to our global ocean.

## Anticipated outcomes for this publication

Governments, the private sector, and society in general are, through this publication and those upon which it draws, equipped with knowledge, capacity, policy options, and plans of action to contain and reduce marine plastic pollution. A major challenge in addressing plastic leakage is the use of reactive approaches.

This document highlights and demonstrates how to move from reactive action to proactive action based on knowledge of the problem. It advocates associating plastic pollution hotspots with interventions that have the potential to remedy the problem using a systematic and standardised approach.

## Publication structure

Chapter 1 covers the global plastic pollution situation, its relation to the climate crisis, and explains the framework used in the IUCN Close the Plastic Tap programme. It supports the overarching objective of this report, which is to demonstrate the value of IUCN's suite of approaches in the fight to prevent plastic pollution in the ocean.

Chapter 2 provides a synthesis of the research findings that have been published in the *Plastic Pollution Hotspotting and Shaping Action Regional Results from Eastern and Southern Africa, the Mediterranean, and Southeast Asia* (Pucino et al., 2020), and across eight plastic pollution hotspotting reports from Kenya, Menorca (Spain), Mozambique, Republic of Cyprus, South Africa, Thailand, United Republic of Tanzania, and Viet Nam.

Chapter 3 presents summaries of the policy and economic research and the circular economy innovations to set the scene for the recommendations in the subsequent chapter. For detailed methods used, please refer to Annex 2.

Chapter 4 shares a synthesis of needs; recommended actions that support the holistic package of solutions; moving toward a plastic circular economy; stakeholder recommendations; and mainstreaming and harmonising methods to eliminate plastic pollution globally.

Chapter 5 covers the lessons learned related to pillars of knowledge, policy, capacity, and business as well as where in the plastics life cycle the learning occurs. Also included is an overview of the monitoring, evaluation and learning aspects to guide strong implementation. The chapter also shares conclusions related to the research, a high-level step-by-step guide to implement methods presented, and what can be done to stop the flow of plastic to the ocean.

# Authorship

This publication is a compilation of the results of several projects and the efforts of many people globally.

*A solution package for plastic pollution – from measurement to action: insights from Eastern and Southern Africa, Southeast Asia, and the Mediterranean* combines previously published content from reports across the IUCN Close the Plastic Tap programme.

Sincere gratitude is expressed to the following content contributors:

The team at Environmental Action (EA) and Quantis International: Guillaume Billard, Julien Boucher, Alexandre Bouchet, Anna Kounina, Paola Paruta, Laura Peano, Margherita Pucino, and Melissa Zgola.

From the United Nations Environment Programme: Feng Wang and Ran Xie.

Consultants who performed research and extracts of whose writings are included here: Estefania Sanabria Garcia (independent), Michael Hall (Reclay StewardEdge), Aanchal Jain (independent), Carlos Litulo (independent), Gerphas Opondo (independent), Marcos A. M. Pereira (independent), Nguyen Hoang Phuong (independent), Naporn Popattanachai (Thammasat University), Olivia Rumble (University of Cape Town) and Adrian Vannahme (Reclay StewardEdge).

The IUCN team members who created and reviewed material used for this publication include: Maeve Nightingale, Bui Thi Thu Hien, and Siriporn Sriaram of the Asia Regional Office; Mariana Blanco Bolaños and Juan Manuel Sabio Morchio of the Environmental Law Team; Alessia Iovinelli and Mercedes Muñoz Cañas of the Centre for Mediterranean Cooperation, Peter Manyara and Thomas Sberna of the Eastern and Southern Regional Office, Leander Raes of the Economics Team, and Janaka De Silva, Lea Dubois, Dorina Seitaj and Joao Sousa of the Ocean Team based in Gland, Switzerland.

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# Glossary

**Assessment.** Used to refer to the results of hotspot, policy, or economic research and analysis in this publication.

**Deposit refund scheme.** A method wherein a deposit fee is charged at the point of purchase, and refunded to the purchaser when the bottle is returned via a specific system (OECD).

**Dumpsite.** A piece of land where waste materials are dumped, outside of a sanitary landfill and with no oversight or management.

**Extended producer responsibility (EPR).** An environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle, as defined by Organisation for Economic Co-operation and Development (OECD).

**Fly tipping.** Another term for illegal dumping.

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

**Hotspots.** Hotspots can be a physical location (as in the traditional definition) where plastic leakage is occurring, as shown in the geographic hotspots that are generated by an assessment. In this research, hotspots are also defined by their type (polymer), where they come from (sector), how they are used (application), and how they are managed in the waste collection/management streams.

**Improperly disposed of.** Waste fraction that is disposed of in a waste management system where leakage is expected to occur, such as a dumpsite or an unsanitary landfill. A landfill is considered unsanitary when waste management quality standards are not met, thus entailing a potential for leakage. Improper waste disposal is the disposal of waste in a way that has negative consequences for the environment.

**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. Informal waste workers (often referred to as 'waste pickers') remain largely invisible, unrecognised in the waste sector, but are an integral part of solving the plastic pollution crisis. Newly established formalised organisations of such individuals, for example, cooperatives, social enterprises, and programmes led by non-governmental organisations (NGOs), can also be considered as the informal sector for the purposes of this methodology.

**Instruments.** The practical ways an intervention may be implemented through specific regulatory, financial, or informative measures, considering contextual 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 instrument may be to introduce a bottle deposit return scheme.

**Intervention.** Tangible action taken to mitigate hotspots. A relevant intervention may be an increase in bottle collection, for example. Decision makers need to prioritise interventions for the most impact, and design interventions that will address the most problematic hotspots.

**Leakage.** Plastic that is released into the environment. The leakage rate is the ratio of leakage to total waste generated, and its value is expressed as a percentage.

**Littering.** Incorrect disposal of waste, such as throwing a cigarette on the ground, dropping a crisp packet, or tossing a drinking cup on the ground. The items may or may not be collected through formal waste management schemes.

**Macroplastics.** Plastics particles, readily visible and with dimensions larger than 5 mm.

**Microplastics.** Plastic particles below 5 mm in size and above 1 mm. Two types of microplastics contaminate the ocean: primary and secondary microplastics. In this publication, the results focus on primary microplastics, which are plastics directly released into the environment in the form of small particles.

**Mismanaged waste index (MWI).** The sum of uncollected and improperly managed waste. The mismanaged waste index is the ratio of mismanaged waste to total waste. Its value is given as a percentage.

**Plastic impact.** Plastic impact refers to potential effects that leaked plastic may have on ecosystems, biodiversity, and/or human health.

**Properly disposed of.** Refers to disposal in a waste management system where no leakage is expected to occur, such as an incineration facility or a sanitary landfill.

**Release rate.** The ratio of leakage to total mismanaged waste. Its value is expressed as a percentage.

**Sanitary landfill.** An area where large quantities of waste are deliberately disposed of in a controlled manner (for example with waste being covered daily and/or the bottom of the landfill designed in a way to prevent waste from leaching out). Landfilling is typically used in the formal collection sector.

**Sustainable waste management.** The collection, transportation, attaching a value to, and disposal of waste to avoid harming the environment, human health, and future generations, and to reduce the amount of natural resources consumed. The sustainable management of waste is key to meeting the Sustainable Development Goals (SDGs), as waste and its impacts touch all of them.

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

# Acronyms

| | |
|---|---|
| **AFD** | Agence Française de Développment |
| **BCSD** | Business Council for Sustainable Development |
| **B-DNA** | Thailand Biodiversity Network Alliance |
| **CBD** | Convention on Biological Diversity |
| **DRS** | Deposit refund scheme, deposit return scheme |
| **EIA** | Environmental impact assessment |
| **EPR** | Extended producer responsibility |
| **EU** | European Union |
| **GDP** | Gross domestic product |
| **GHG** | Greenhouse gas |
| **HDPE** | High-density polyethylene (e.g., milk containers, shampoo bottles) |
| **IUCN** | International Union for Conservation of Nature |
| **LDPE** | Low-density polyethylene (e.g., bags, container lids) |
| **LEADERGALP** | Local Fisheries Action Group of Menorca |
| **LR** | Leakage rate |
| **MARPLASTICCs** | Marine Plastics and Coastal Communities |
| **MARPOL** | International Convention for Prevention of Pollution from Ships |
| **MEA** | Multilateral Environmental Agreement |
| **MWI** | Mismanaged Waste Index |
| **NCB** | National Coordinating Body |
| **OECD** | Organisation for Economic Co-operation and Development |
| **NGO** | Non-governmental organisation |
| **NSC** | National Steering Committee |
| **PAYT** | Pay as you throw |
| **PE** | Polyester |
| **PET** | Polyethylene terephthalate[2] (e.g., bottles, food wrapping) |
| **PlastiCoCo** | Plastics and Coastal Communities |
| **PP** | Polypropylene (e.g., hot food containers, sanitary pad liners) |
| **PS** | Polystyrene (e.g., food containers, disposable cups) |
| **PVC** | Polyvinyl chloride (e.g., construction pipes, toys, detergent bottles) |
| **PWFI-Med** | Plastic Waste Free Islands, Mediterranean |
| **RR** | Release rate |
| **RVM** | Reverse vending machine |
| **SDGs** | Sustainable Development Goals |
| **Sida** | Swedish International Development Cooperation Agency |
| **UNEP** | United Nations Environment Programme |
| **UNCLOS** | United Nations Convention on the Law of the Sea |
| **VFM** | Value for money |
| **WWF** | World Wide Fund for Nature |

2 Note: In this publication, when referring to the pilot reports, PET resins are distinguished from polyester which includes polyester fibre, polyester films, and polyester engineered resins.

# 1. Introduction

**This chapter covers** the global plastic pollution situation and its relation to the climate crisis, and explains the framework used in the IUCN Close the Plastic Tap programme. It supports the overarching objective of this report, which is to demonstrate the value of IUCN's suite of approaches in the fight to prevent plastic pollution from entering the ocean.

The main sources for the material in this chapter are *Primary Microplastics in the Oceans: A Global Evaluation of Sources* (Boucher and Friot, 2017), 'More than 1000 rivers account for 80% of global riverine plastic emissions into the ocean' (Meijer et al., 2021), and the *National Plastic Pollution Hotspotting Reports* (IUCN et al., 2020) with additional sources cited in the text.

## 1.1. Plastic and the global plastic pollution problem

Plastic is a synthetic organic polymer made from petroleum, with properties ideally suited for a wide variety of applications, including in packaging, building and construction, household and sports equipment, vehicles, electronics, and agriculture. Plastic provides many benefits to society. Nearly 400 million tonnes of plastic are produced every year, half of which is used for single-use items such as shopping bags, cups, and straws (Boucher and Friot, 2017). At least 14 million tonnes of plastic end up in the ocean every year (IUCN, 2021). Plastic debris is currently the most abundant type of litter in the ocean, making up 80% of all marine debris found from surface waters to deep-sea sediments. Plastic is found on the shorelines of every continent, with more plastic waste found near popular tourist destinations and densely populated areas.

The main sources of plastic debris found in the ocean are land-based. They include urban and stormwater runoff, sewer overflows, littering, inadequate waste disposal and management, industrial activities, tyre abrasion, and illegal dumping. Ocean-based plastic pollution originates primarily from the fishing industry, nautical activities, and aquaculture.

Under the influence of solar ultraviolet radiation, wind, currents and other natural factors, plastic breaks down into small particles called microplastics (particles smaller than 5 mm) or nanoplastics (particles smaller than 100 nm). Their size makes them easy for marine life to ingest accidentally.

Many countries lack infrastructure to prevent plastic pollution, such as sanitary landfills, incineration facilities, recycling capacity and circular economy infrastructure, and proper waste management and disposal systems. This leads to plastic leakage into rivers and the ocean. The legal and illegal global trade of plastic waste may also damage ecosystems, where waste management systems in the receiving country are not enough to contain the imported plastic waste.

Improperly discarded plastics leak into the ocean through several pathways, but the primary transport mechanism is rivers. In 2018, IUCN reported that 80% to 90% of all microplastics found in the ocean were carried to the coastal zone by just ten rivers, in India, China and Africa. New research published (Meijer et al., 2021) estimates that more than 1,000 rivers account for 80% of global annual leakage of plastic to the ocean. Therefore, a source-to-sea approach is needed to deal with plastic pollution.

Plastics are released into the environment at different stages of the plastic life cycle.

Throughout the life cycle, there are numerous deleterious impacts on the climate and the environment. Plastic production is strongly linked to climate change. Plastic contributes to global climate change with emissions released in the production, transportation, and disposal phases. At the end of the current linear life cycle, if plastic waste is incinerated, it releases carbon dioxide and many other chemicals into the atmosphere, thereby increasing carbon emissions and air pollution overall. Open burning of plastic waste can pose significant risks for human health, owing to the release of noxious chemical substances such as dioxin and particulate matter (IUCN, EA, Quantis, 2020). These emissions are the result of a combination of inadequate waste collection, uncontrolled dumping, and burning of waste (releasing particulates, chemicals from additives, etc), which are activities that result in plastic pollution leaking into the ocean (Kaza et al., 2018)

If reducing mismanaged plastic waste remains a priority for nations, as is indicated by the momentum behind a global plastic pollution management treaty (Parker, 2021), solutions need to be found and implemented. The complexity of the plastic pollution crisis requires a holistic, integrated approach. Upstream changes to plastic production, transportation, consumption patterns, and legislative frameworks are needed, as are new economic models and downstream actions to improve waste management.

## 1.2. IUCN Close the Plastic Tap programme

The problem of marine plastic pollution is complex and multifaceted. IUCN's programme on marine plastics seeks solutions to 'close the plastic tap' by tackling plastic pollution across the value chain. This involves enhancing understanding of the problem through research and the compilation of the latest relevant science, policy, and data, and mobilising a wide range of stakeholders including governments, industries, and society to leverage this knowledge for action.

The IUCN Close the Plastic Tap programmatic strategy addresses the key drivers of plastic leakage, encourages a move from linear to circular economic systems, that are socially inclusive, and facilitates replication by having clear methodologies and approaches.

The IUCN approach begins with creating science-based knowledge from scientific assessments and identifies the policy, economic, and governance aspects of the problem, while engaging with stakeholders and partners to support action and learning. This combined approach includes working with business to build capacity to address the problem of plastic pollution, which ranges from training on how to perform a national hotspotting assessment, to financial support in the form of small grants to help strengthen an integrated circular-economy approach.

**Objectives:** IUCN Close the Plastic Tap programme

- **Develop data and analytics:** develop, and mainstream tools underpinning the global state of knowledge on plastic production and impacts
- **Create economic and policy assessments:** determine and assess demand-responsive actions to eliminate plastic pollution
- **Set standards:** develop consistent assessment methodologies that are replicable
- **Engage the private sector:** with a plastics-specific business engagement strategy
- **Assess:** the full plastics value chain to create means for transformational action

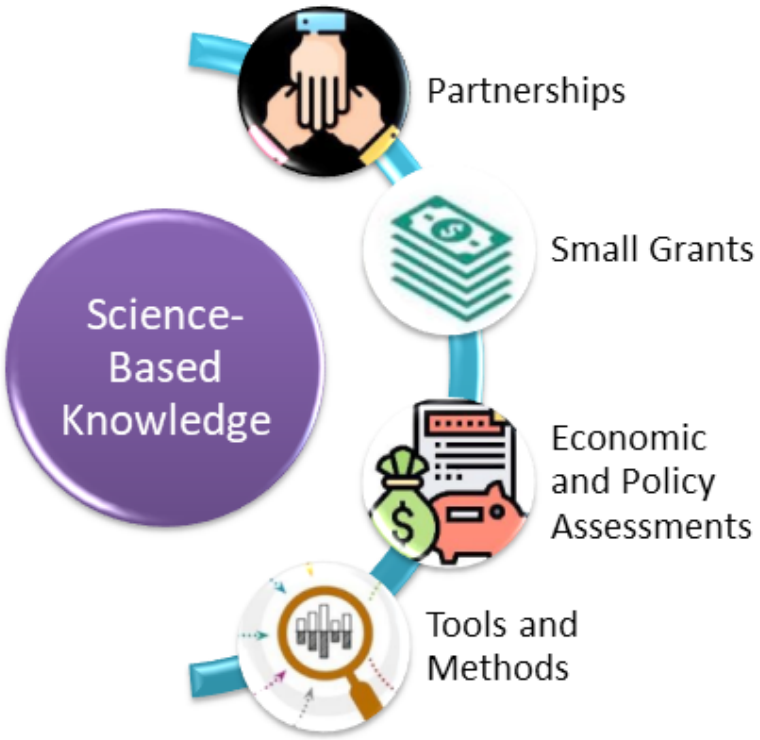



**Figure 1.** The IUCN integrated approach used in its Close the Plastic Tap programme.
*Source: IUCN, 2021.*

IUCN aims to reduce plastic leakage into the environment by:

- Informing and influencing public policy, corporate policies, and operations;
- Developing knowledge products (methods, assessments, tools); and
- Influencing and aligning stakeholders.

Programmatic outputs have included subnational, national, and regional plastic pollution reports and recommendations for action, communications products (videos, infographics, news stories, tutorials), and subnational and national policy assessments, including in-depth assessments of mechanisms such as extended producer responsibility (EPR). These are for use by policy and decision makers, enabling them to act with confidence to address the many challenges that the plastic pollution crisis presents.

As part of an overall approach towards tackling plastic pollution, this publication is unique to the IUCN Close the Plastic Tap programme, as it highlights the application of a multi-pronged approach in three regions across three of our projects. The differing context for each location with respect to plastic waste management provides for valuable comparisons and contrasts. It also highlights how the UNEP/IUCN hotspotting methodology can be adapted in diverse countries and subnational areas including islands. This publication brings new levels of granularity and transparency, along with an action-oriented methodology that links the hotspotting results to approaches that are part of a package of solutions. That package also includes economic assessment tools, policy and legislative gap analyses and recommendations, priority interventions, business engagement approaches, and circular economy models.

This publication focuses on both technical and policy aspects of plastic pollution elimination measures. The target audience includes:

- Governments and policy makers of the target regions and countries
- Intergovernmental and non-governmental organisations with interest in the control and reduction of plastic pollution
- Plastic manufacturer associations and plastics pacts

- Corporations that contribute to plastic pollution
- Regional economic organisations

Herein, we build on IUCN's plastic pollution work which began in 2014, and has produced a series of analytical reports, including documenting the unfolding crisis through comprehensive assessments in the Baltic Sea, the Caribbean, Eastern and Southern Africa, the Mediterranean, Oceania, and Southeast Asia. The numerous reports that have been published under the Close the Plastic Tap programme offer decision makers a well-rounded and sound basis for taking appropriate action. Below is an overview of key lessons learned and aspects to consider.

Of note, three IUCN projects are discussed in this publication: Marine Plastics and Coastal Communities (MARPLASTICCs) in Asia and Eastern and Southern Africa, Plastic Waste Free Islands – Mediterranean, and PlastiCoCo – Tanzania.

**Figure 2.** A map of IUCN projects that make up the current Close the Plastic Tap programme. Projects are being, or have been, conducted in 17 countries since 2014: Antigua and Barbuda, Fiji, Grenada, Kenya, Menorca, Spain, Mozambique, Republic of Cyprus, Samoa, São Tomé and Príncipe, Senegal, South Africa, St Lucia, United Republic of Tanzania, Thailand, the Azores, Portugal, Vanuatu, and Viet Nam. Publications have been created for several regions as well, and are available from the Close the Plastic Tap programme website. *Source: IUCN, 2021.*

## 1.3. Necessary enabling environments

There is a need for national-level engagement of committees of experts, to have an overview of all aspects of a country's plastic pollution situation and how to approach it. Each country included in this report created strategic coalitions, national steering committees (NSCs) or national action boards (NABs) made up of stakeholders from government, business, civil society, and academia, to review and guide the processes. Their roles, scopes, and functions were defined and agreed by members and differed from country to country based on the needs. These committees became platforms that continue to facilitate sharing across a diverse group of stakeholders and guide strategic decision-making processes. They serve as enablers for paths to implement key plastic pollution prevention activities in accordance with existing national strategies and frameworks.

In Thailand and Viet Nam, for example, the NSCs were formed from the existing members of a previous conservation project, the Mangroves for the Future (MFF) National Coordinating Body (NCB). The NCB mandate was to provide strategic direction and oversight for the implementation of the MFF National Programmes in line with national policy and strategy priorities. The core goal and mission of MFF regionally and nationally was to strengthen coastal resilience through good governance and action on the ground through grants projects.

The MFF programme in the IUCN Asia region operated for 12 years and thus the related first NCB was well established by 2018, when the Marine Plastics and Coastal Communities (MARPLASTICCs) project started, because of the MFF networks and previous work. It was a matter of IUCN making the case to the MFF NCB members that tackling marine plastic pollution was an additional focus and central mandate for maintaining resilience of coastal areas through the established integrated coastal management approach. Once the NCB acknowledged the issue of marine plastics, it became a priority issue and it was straightforward to convene select members of the NCB to perform their usual functions to fulfil the expectations of the MARPLASTICCs NSC.

Because of IUCN's mandate on marine plastics, it engaged with a new government partner in Thailand, the Pollution Control Department (PCD), to be a part of the NCB/NSC. The decision by the NCB to adopt the new priority issue of marine plastic pollution was not complicated, as the political will in both Thailand and Viet Nam was high. This is one example, but there are different entry points to create NSCs/NCBs/NABs based on the country context, and it is important to note that each country will be at a different point on the knowledge pathway for plastic pollution mitigation when beginning to assess their plastic pollution.

The value of having national steering committees or coordinating bodies is threefold. Engagement with these stakeholders ensures: **1)** that by establishing a strategic coalition, progress can be tracked locally and nationally; **2)** that the members are tasked with review and adoption of work plans, and sharing their expertise and critical feedback; and **3)** that decisions on the steps to take to manage plastic pollution will be in line with national priorities and will build on existing plastic pollution strategies and frameworks.

Once the enabling environment is in place and key stakeholders are assembled, research and data collection can begin for plastic pollution hotspotting. In parallel, policy and economic research can also begin. Implementation of the approaches is presented in Table 1.

**Table 1.** Complexity of institutional arrangements used for setting up the enabling environments.

| | Location | Sector engagement | Partner organisations | Project Engagement |
|---|---|---|---|---|
| Eastern and Southern Africa | Kenya | Government of Kenya, through its Ministry of Environment and Forestry; the National Environment Management Authority; Ministry of Tourism and Wildlife; Ministry of Industry, Trade and Cooperatives. | • Council of County Governors<br>• Kenya Association of Manufacturers (KAM)<br>• Kenya Environment and Waste Management Association<br>• Kenya PET Recycling Company (PETCO)<br>• University of Nairobi | • Annual meetings<br>• Each NSC identified the national plastic hotspot assessment as a very important deliverable to guide them towards reducing marine plastic pollution<br>• Input to policy and economic assessments and briefings<br>• Inputs to circular-economy project selection<br>• Meetings to understand and deliberate on the proposed national action plans on marine litter and plastics<br>• National plastic pollution hotspotting assessments, research<br>• Validation workshop in each country |
| | Mozambique | Government of Mozambique, through its Ministry of Sea, Inland Waters and Fisheries via the National Institute of Fisheries Research and National Directorate of Fisheries and Maritime Policy; the Ministry of Environment and Land via the National Directorate of Environment; Ministry of Industry and Commerce. | • 3R Ltd<br>• Eduardo Mondlane University<br>• Mozambique Recycling Association | |
| | South Africa | Government of South Africa, through its Department of Environment, Forestry and Fisheries via the Waste Management Branch and the Oceans and Coasts Branch; Department of Trade and Industry via the Plastics Desk and the Green Industries Unit; Department of Science and Technology via the Council for Scientific and Industrial Research. | • National Cleaner Production Centre for South Africa<br>• Ocean Hub Africa Innovation Labs<br>• Plastics SA<br>• Sustainable Seas Trust<br>• University of Cape Town<br>• Water Research Commission | |
| | United Republic of Tanzania | Academia; three municipal circular-economy businesses; Government of the United Republic of Tanzania, through The Office of Vice President (Department of Environment); National Environment Management Council. | • ARENA Recycling Industries<br>• ECO Act<br>• Embassy of Ireland<br>• Institute of Marine Sciences<br>• Jane Goodall's Roots and Shoots<br>• Libe Green Innovation<br>• Nipe Fagio<br>• PREYO<br>• Seasense<br>• SIDA / Embassy of Sweden<br>• Sokoine University of Agriculture<br>• Tanzania Gender Networking Programme<br>• Tanzania Marine Parks and Reserves Unit<br>• Tanzania Recyclers Association<br>• The Nature Conservancy<br>• United Nations Environment Programme, Tanzania<br>• University of Dar es Salaam<br>• University of Dodoma<br>• World Wide Fund For Nature (WWF Tanzania) | • National plastic pollution hotspotting assessment, plastics data research in country<br>• Three case studies on circular economy<br>• Validation workshop |

| | | | | |
|---|---|---|---|---|
| Mediterranean | Republic of Cyprus | Government of the Republic of Cyprus; Ministry of Agriculture, Rural Development and Environment; Department of Fisheries and Marine Research; Department of Environment; Deputy Ministry of Tourism. | • Association of Cyprus Travel Agents<br>• Cyprus Hotel Association<br>• Cyprus Hotel Managers Association<br>• Cyprus Port Authority.<br>• Cyprus Sustainable Tourism Initiative<br>• Green Dot Cyprus<br>• Integrated Solid Waste Management<br>• Together Cyprus | • Input to policy and economic assessments and briefs<br>• Subnational and national plastic pollution hotspotting assessments, research<br>• Validation workshop |
| | Menorca, Spain | Menorca Insular Council, and the Socio-Environmental Observatory of Menorca (OBSAM); Department of Environment; the Menorca Biosphere Reserve Agency; General Directorate of Waste and Environmental Education; Agency of Tourism Strategy of the Government of the Balearic Islands. | • "Per la mar viva" group, Marilles Foundation<br>• Balearic Group of Ornithology and Defence of Nature<br>• LEADERGALP – Local Fisheries Action Group of Menorca<br>• Menorca Preservation Fund<br>• Save the Med Foundation<br>• World Network of Island and Coastal Biosphere Reserves (ZERO Plastic Group) | |
| Southeast Asia | Thailand | Government of Thailand, through the Department of Marine and Coastal Resources, and Pollution Control Department. | • Mangroves for the Future as the lead for the National Coordinating Body<br>• Business networks engaged such as Viet Nam VB4E and BSCD and Thailand B-DNA and BCSD | • National plastic pollution hotspotting assessments, research<br>• Validation workshop<br>• Input to policy and economic assessments and briefs<br>• Annual meetings<br>• Inputs to circular-economy project selection<br>• Meetings to discuss national policies on plastic pollution |
| | Viet Nam | Government of Viet Nam Ministry of Natural Resources and Environment; Ministry of Construction; Ministry of Agriculture and Rural Development; local government in Ho Chi Minh City, Quang Nam Province and Da Nang City. | | |

*Source: IUCN, 2021.*

# 2. Plastic pollution hotspotting pilots

**This chapter provides** a synthesis of the research findings from the publication, *Plastic Pollution Hotspotting and Shaping Action: Regional Results from Eastern and Southern Africa, the Mediterranean, and Southeast Asia* (Pucino et al., 2020), and from eight plastic pollution hotspotting reports for Kenya, Menorca (Spain), Mozambique, Republic of Cyprus, South Africa, Thailand, United Republic of Tanzania, and Viet Nam.

The main sources for the material in this chapter are *Plastic Pollution Hotspotting and Shaping Action: Regional Results from Eastern and Southern Africa, the Mediterranean, and Southeast Asia* (Pucino et al., 2020) and the *National Plastic Pollution Hotspotting Reports* (IUCN et al., 2020) with additional sources cited in the text.

## 2.1. Background

Countries derive billions of dollars of marine goods and services from the ocean annually through fisheries, trade, and tourism, all of which are threatened by plastic pollution (Raes et al., 2021; UNEP, 2014). The problem of plastic pollution is caused by a multitude of factors, including but not limited to: unsustainable economic systems and behaviour patterns; non-existent or unenforced legislation; inefficient waste management systems; and multiple layers of leakage sources. While some countries have reduced their plastic footprint in the ocean through advances in waste management, treatment and recycling, many countries still struggle with plastic releases into coastal and marine waters due to inappropriate disposal of solid waste.

IUCN's decision to undertake research across the eight pilot areas emerged from the research of the Close the Plastic Tap programme, especially as an outcome of the publication of *Review of plastic footprint methodologies: Laying the foundation for the development of a standardised plastic footprint measurement tool* (Boucher et al., 2019)

Presented in this chapter are summaries from the eight hotspot assessments. The assessments are publicly available and provide results that identify priority actions to eliminate plastic leakage.[3]

## 2.2. Data quality

The pilots presented come with the caveat that data quality varied, as did the availability of national sources. In some locations, more and higher quality data were available. The

3 The eight assessments are available here: https://plastichotspotting.lifecycleinitiative.org/pilots/

assessments provide the most current, consistent datasets, with information on domestic plastic inputs, waste management and plastic leakage. Combined with on-site data collection missions, and the publicly available Comtrade data, these sources are the basis for the models and the assessments shared here.

## 2.3. Summary of hotspotting findings

The results of the eight assessments showed that, on average, Thailand and Viet Nam produce ten times more plastic leakage than Kenya, and five times more than South Africa (per capita). Kenya and South Africa are the two largest contributors to plastic leakage among the pilot sites in Africa. Absolute plastic leakage from the Mediterranean islands is 100 to 1,000 times less than that of countries that were assessed in this research in Africa and Asia. The low leakage of these small islands can be explained not only by their low populations but also by their more efficient waste management systems. Assessment of waste systems showed low collection rates, burning of waste, and general waste mismanagement all contributed to the issue of plastic leaking to the ocean.

LDPE, PET and PP, polymers that are extensively used in the packaging sector, are consumed in large quantities across every region, with packaging making up 45% of total plastic consumption worldwide (Geyer et al., 2017). Due to their ubiquitous use in packaging applications, these polymers are more likely than others to be littered or mismanaged. They eventually leak into waterways and the ocean.

The density of plastic leakage is much higher in urban areas than in rural ones, yet rural areas are also responsible for plastic pollution of waterways. For all pilot sites, leakage density (leakage per $km^2$) in waterside communities was higher than for inland areas.

Additional technical details and analysis are available in the IUCN regional results publication, *Plastic Pollution Hotspotting and Shaping Action: Regional Results from Eastern and Southern Africa, the Mediterranean, and Southeast Asia* (Pucino et al., 2020).

**Table 2.** High-level summary of plastic pollution hotspot assessments, by region.

| | |
|---|---|
| **Eastern and Southern Africa** | • In South Africa, although the hotspotting assessment's estimate of plastic leakage to waterways and the ocean is half of the average estimated by Jambeck et al. (2015) at 79 kt instead of 157 kt, it still contributes 35% of total plastic leakage within the Eastern and Southern Africa region.<br>• For Kenya, it is quite the opposite as the plastic leakage estimate is six times that from Jambeck et al. (2015), at 37 kt instead of 6 kt.<br>• For Mozambique, the estimate is one-and-a-half times that of Jambeck et al. (2015), with 17 kt instead of 11 kt.<br>• For United Republic of Tanzania, the estimate of 29 kt is more than twice that of Jambeck et al. (2015) of 12 kt.<br>• Based on these studies, Kenya, Mozambique, and the United Republic of Tanzania contribute 16%, 7.5% and 13%, respectively, to the total plastic leakage in the Eastern and Southern Africa region. |

| | |
|---|---|
| Mediterranean | • In absolute terms, the Mediterranean islands do not leak large quantities of plastic, as compared to the other two regions covered by this report.<br>• Calculations estimate that in the Republic of Cyprus and Menorca up to 11% and 23%, respectively, of the waste generated is due to tourism.<br>• These numbers still lead to high per capita leakage (around 1 kg/capita/year). |
| Southeast Asia | • Within Southeast Asia, plastic leakage estimates for Viet Nam are like average estimates from Jambeck et al. (2015), while in the case of Thailand there is a significant difference between the estimates (452 kt (Jambeck) and 336 kt (IUCN et al., 2020)).<br>• Viet Nam and Thailand contribute 19% and 14%, respectively, of the total plastic leakage stemming from the region.<br>• In Southeast Asia, leakage per capita is high and consistent across the region's pilot areas, with 5 kg/capita/year in Thailand and 4.7 kg/capita/year in Viet Nam.<br>• The drivers of plastic pollution in the two countries studied in Southeast Asia include the fact that plastic consumption levels in Thailand and Viet Nam are high. |

*Source: National guidance for plastic pollution hotspotting and shaping action, pilot reports. International Union for Conservation of Nature-Environmental Action-Quantis (IUCN et al., 2020).*

### 2.3.1. Eastern and Southern Africa

The Western Indian Ocean region has more than 10,000 km of coastline, from Kenya to South Africa. Per capita leakage of plastic to waterways and the ocean in Eastern and Southern Africa varies from 0.5 kg/capita/year in the United Republic of Tanzania to 1.4 kg/capita/year in South Africa (Pucino et al., 2020). Most of the values from these site-specific studies fall below the Eastern and Southern African region average of 1.3 kg/capita/year calculated by Jambeck et al. (2015).

In Africa, the regional mechanism for addressing recommendations on land-based sources of marine litter is the Nairobi Convention, geared towards the protection, management, and development of the coastal and marine environment in the Eastern Africa region. A snapshot of the challenges, based on data from the 2020 report *Plastic Pollution Hotspotting and Shaping Action: Regional Results from Eastern and Southern Africa, the Mediterranean, and Southeast Asia* (Pucino et al., 2020) includes:

- Cumulatively, approximately two million tonnes of plastics are subject to mismanagement across the Eastern and Southern Africa region, mainly due to low collection and recovery of plastic waste – 27% to 60% collection rate – and low recycling rates that range from 1% to 14%. The very limited nature of waste collection and disposal systems, where available, and the lack of waste management infrastructure with sustainable mechanisms throughout the region, are key drivers of plastic pollution. The systems are not enough to handle the volume of waste generated.
- In general, African countries produce and waste less plastic per capita than Asian countries. Plastic waste generation in Africa spans from 6 to 41 kg/capita/year compared to 58 to 74 kg/capita/year in Asia. Leakage per capita in Africa is also lower than in Asia (at circa 1 kg/capita/year versus circa 5 kg/capita/year) but is quite like the leakage seen in Mediterranean countries (Boucher and Billard, 2020).
- In Mozambique, Kenya and the United Republic of Tanzania, the waste generated is almost entirely subject to mismanagement. The high mismanagement values are mainly related to low collection rates.

### 2.3.2. The Mediterranean

Absolute plastic leakage from the Mediterranean islands is 100 to 1,000 times less than that of countries in Africa and Asia. This is explained by their lower populations and more efficient waste management systems. Neither Menorca nor the Republic of Cyprus has plastic

recycling facilities – both export all collected plastic waste.

The Republic of Cyprus and Menorca together contribute to less than 1% of the total leakage arising from all the nations bordering the Mediterranean Sea (0.1% for the Republic of Cyprus and 0.01% for Menorca). In both the Republic of Cyprus and Menorca, leakage per capita amounts to around 0.9 kg/capita/year, which is below the average for Mediterranean nations of 1.6 kg/capita/year. This leakage per capita value is close to that of Kenya, where plastic waste is largely mismanaged. Considering that waste management systems in the Republic of Cyprus and Menorca operate well, waste generation per capita is higher on the Mediterranean islands than in Kenya (Pucino et al., 2020).

What is driving plastic pollution in the two Mediterranean islands studied? In absolute terms, the Mediterranean islands do not leak large quantities of plastic. Calculations estimate that up to 11% and 23%, respectively, of the waste generated in the Republic of Cyprus and Menorca is due to tourism (which can confound the "per capita" figures, due to seasonal variations in population). However, these numbers still lead to significant per capita leakage (around 1 kg/person/year). This leakage, which stems only from uncollected plastic waste, is driven by very high plastic waste generation per capita.

### 2.3.3. Southeast Asia

Within Southeast Asia, plastic leakage estimates for Viet Nam are like the averages estimated by Jambeck et al. (2015), while in the case of Thailand a certain difference is visible, as per the table above. With these substantial quantities of plastic leaking into waterways and the ocean, Viet Nam and Thailand contribute 19% and 14%, respectively, of the total plastic leakage stemming from the region. In Southeast Asia, leakage per capita is high and consistent across the region's pilot areas, with 5 kg/capita/year in Thailand and 4.7 kg/capita/year in Viet Nam. This is above the average of 4 kg/capita/year for the region derived from Jambeck et al. (2015).

The drivers of plastic pollution in these two countries include the fact that their plastic consumption levels are high. Plastic is heavily present in all sectors (packaging, textile, and construction); and on-the-go plastic products are ubiquitous in everyday life. Leakage per capita is five times higher in Thailand and Viet Nam than in the other six pilot sites. This is due to a combination of high plastic consumption and rather poor waste management practices. In Viet Nam, more than half of the plastic waste generated remains uncollected, while in Thailand it is slightly more than a quarter. Uncollected plastic is a large driver of the significantly high mismanagement values. It is important to note that what is reported for Viet Nam for collected and improperly disposed waste may have been underestimated because it was not possible to properly quantify the amount of plastic disposed of at landfills. Nevertheless, this limitation does not significantly affect the leakage estimate.

## 2.4. Polymer hotspot summary

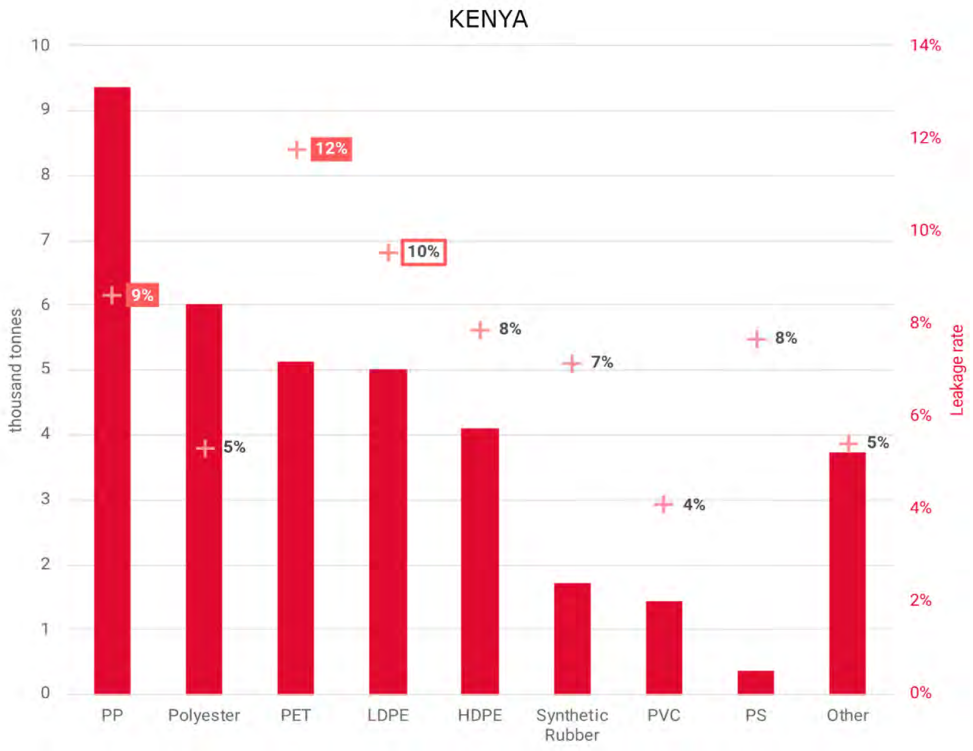
In Eastern and Southern Africa, polypropylene (PP), low-density polyethylene (LDPE) and polyethylene terephthalate (PET) were the most common polymers identified in the hotspotting assessments. PET is a problem in all the pilot countries in Eastern and Southern Africa, as is LDPE, except for Kenya. LDPE is used for plastic bags, and LDPE bags were banned in Kenya in 2017. Bags using PP were not banned, however, and have largely replaced LDPE bags there, which is likely the reason for it being Kenya's top leaking polymer by absolute leakage (Pucino et al., 2020). The LDPE share of total leakage is also low in United Republic of Tanzania, compared to other African countries. There, a plastic bag ban came into effect in 2019 and might have

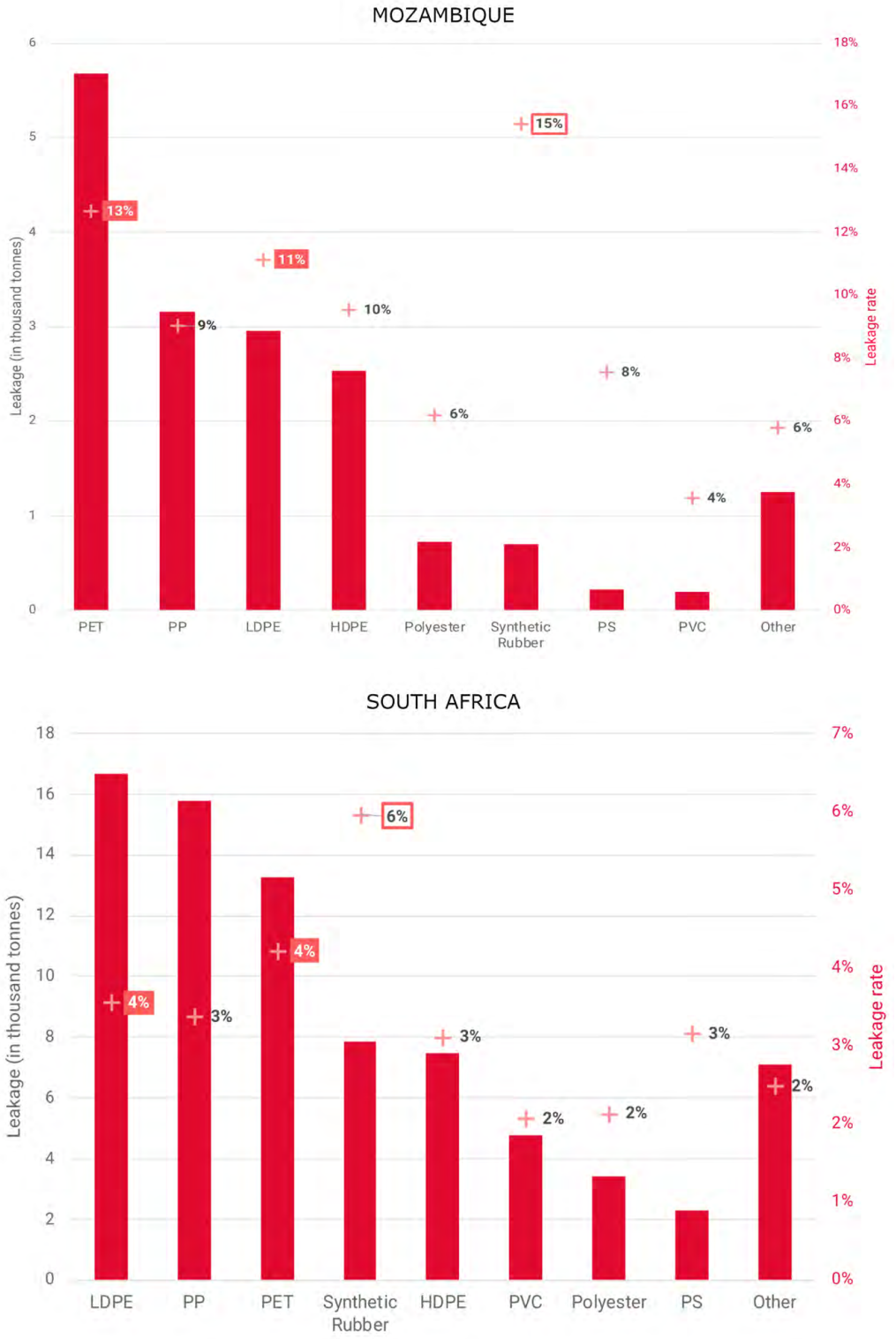
already impacted the trade and production of bags in 2018. The impact seen may be linked to domestic policy moves related to the signal sent by the East African Community Polythene Materials Control Bill from 2016, and the overall projected decline in demand (Pucino et al., 2020).

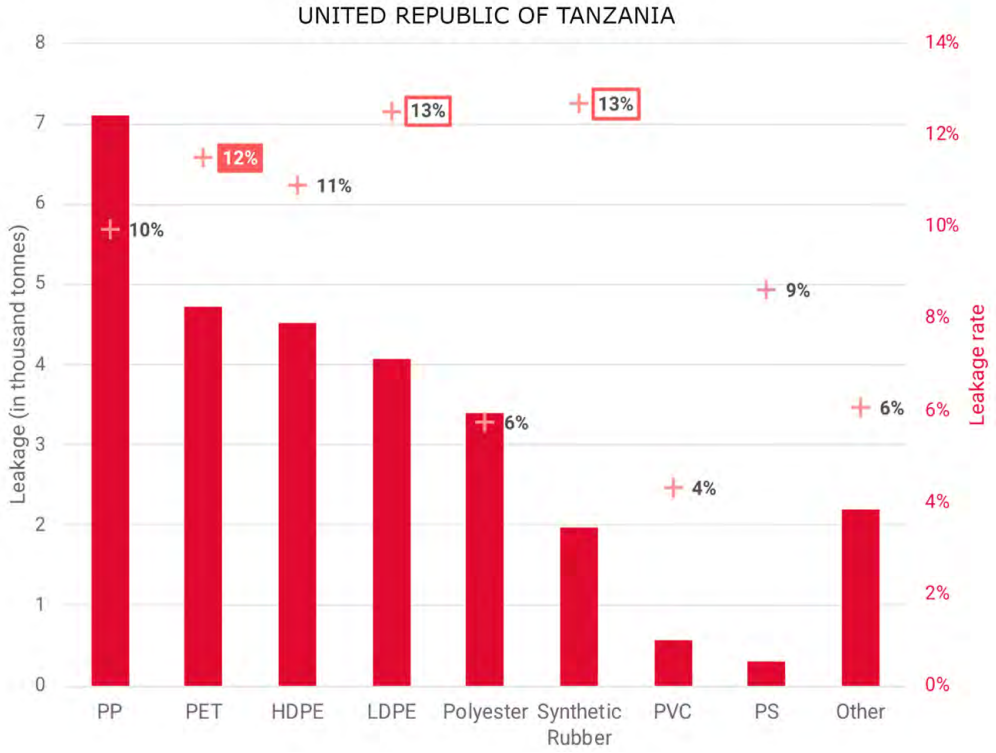
In the Mediterranean, between the two islands, LDPE, PET, PP, and synthetic rubber (from tyres) contributed the most polymer leakage. Synthetic rubber, it is important to note, has two leakage pathways: macro-leakage from waste mismanagement and micro-leakage from tyre abrasion (Pucino et al., 2020).

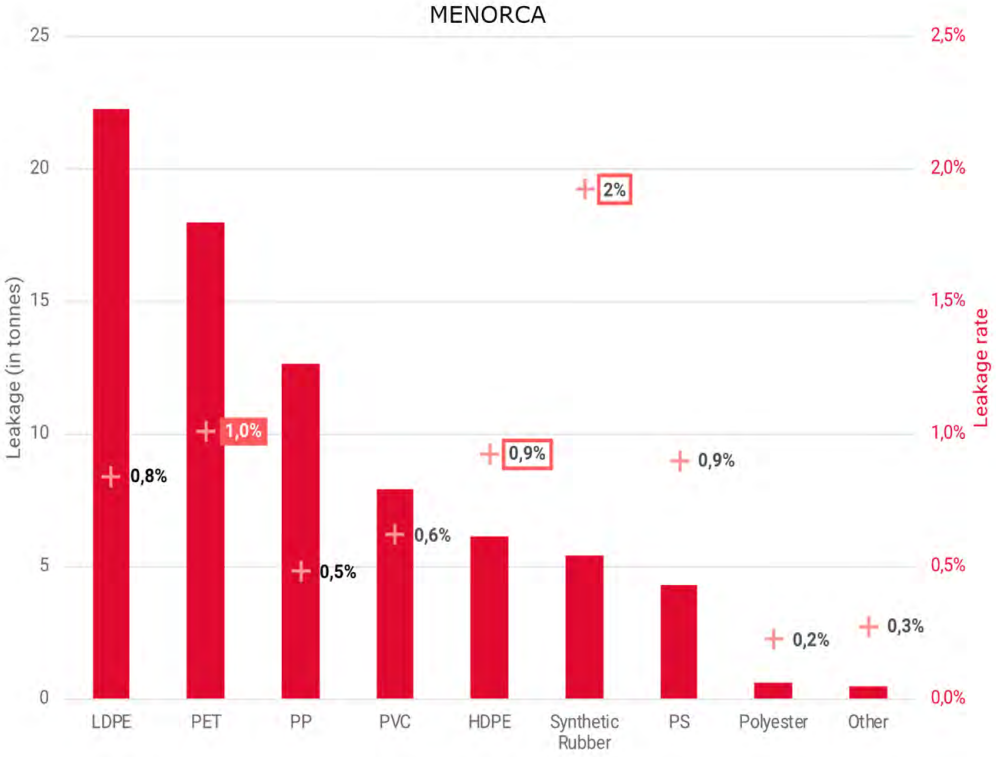
In Southeast Asia, the research showed that LDPE, PP, PET, and polyester were the most common polymers leaking into the environment. In Thailand, PET waste generated in the country is recycled domestically (37%) or exported for recycling (19%). In Viet Nam, the PP share of absolute leakage is very high, while in Thailand PP is extensively recycled (22%) or exported for recycling (11%).

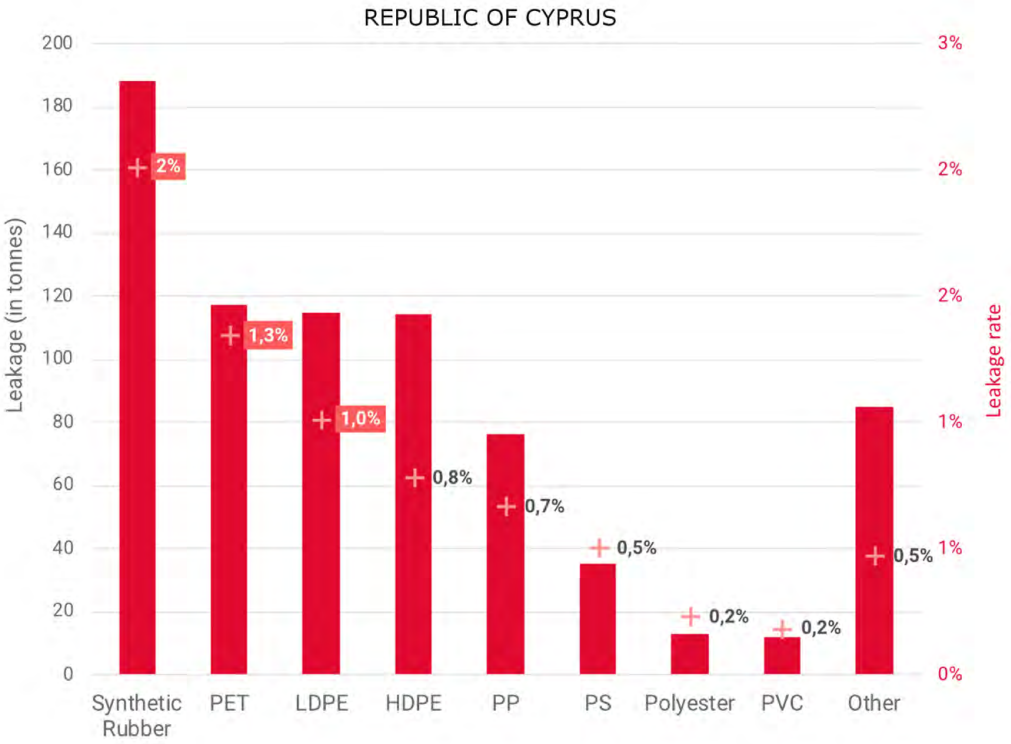
The eight polymer hotspots are shown in Figure 3, and a summary of polymer hotspots and key takeaways are shown in Table 3, below Figure 3.

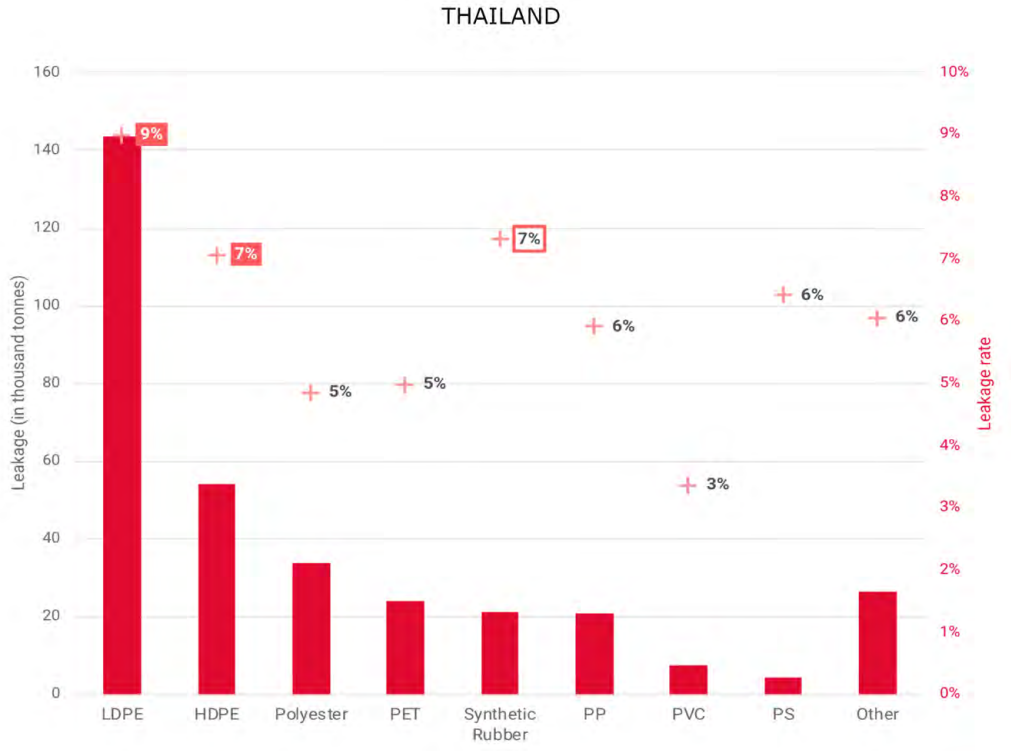



MOZAMBIQUE
Leakage (in thousand tonnes)
Leakage rate
0
1
2
3
4
5
6
0%
2%
4%
6%
8%
10%
12%
14%
16%
18%
13%
9%
11%
10%
6%
15%
8%
4%
6%
PET
PP
LDPE
HDPE
Polyester
Synthetic Rubber
PS
PVC
Other
SOUTH AFRICA
Leakage (in thousand tonnes)
Leakage rate
0
2
4
6
8
10
12
14
16
18
0%
1%
2%
3%
4%
5%
6%
7%
4%
3%
4%
6%
3%
2%
2%
3%
2%
LDPE
PP
PET
Synthetic Rubber
HDPE
PVC
Polyester
PS
Other


UNITED REPUBLIC OF TANZANIA
Leakage (in thousand tonnes)
Leakage rate
0
1
2
3
4
5
6
7
8
0%
2%
4%
6%
8%
10%
12%
14%
10%
12%
11%
13%
13%
6%
4%
9%
6%
PP
PET
HDPE
LDPE
Polyester
Synthetic Rubber
PVC
PS
Other


MENORCA
Leakage (in tonnes)
Leakage rate
0
5
10
15
20
25
0,0%
0,5%
1,0%
1,5%
2,0%
2,5%
0,8%
1,0%
0,5%
0,6%
0,9%
2%
0,9%
0,2%
0,3%
LDPE
PET
PP
PVC
HDPE
Synthetic Rubber
PS
Polyester
Other


REPUBLIC OF CYPRUS
Leakage (in tonnes)
Leakage rate
200
180
160
140
120
100
80
60
40
20
0
3%
2%
2%
1%
1%
0%
2%
1,3%
1,0%
0,8%
0,7%
0,5%
0,2%
0,2%
0,5%
Synthetic Rubber
PET
LDPE
HDPE
PP
PS
Polyester
PVC
Other


THAILAND
Leakage (in thousand tonnes)
Leakage rate
160
140
120
100
80
60
40
20
0
10%
9%
8%
7%
6%
5%
4%
3%
2%
1%
0%
9%
7%
5%
5%
7%
6%
3%
6%
6%
LDPE
HDPE
Polyester
PET
Synthetic Rubber
PP
PVC
PS
Other

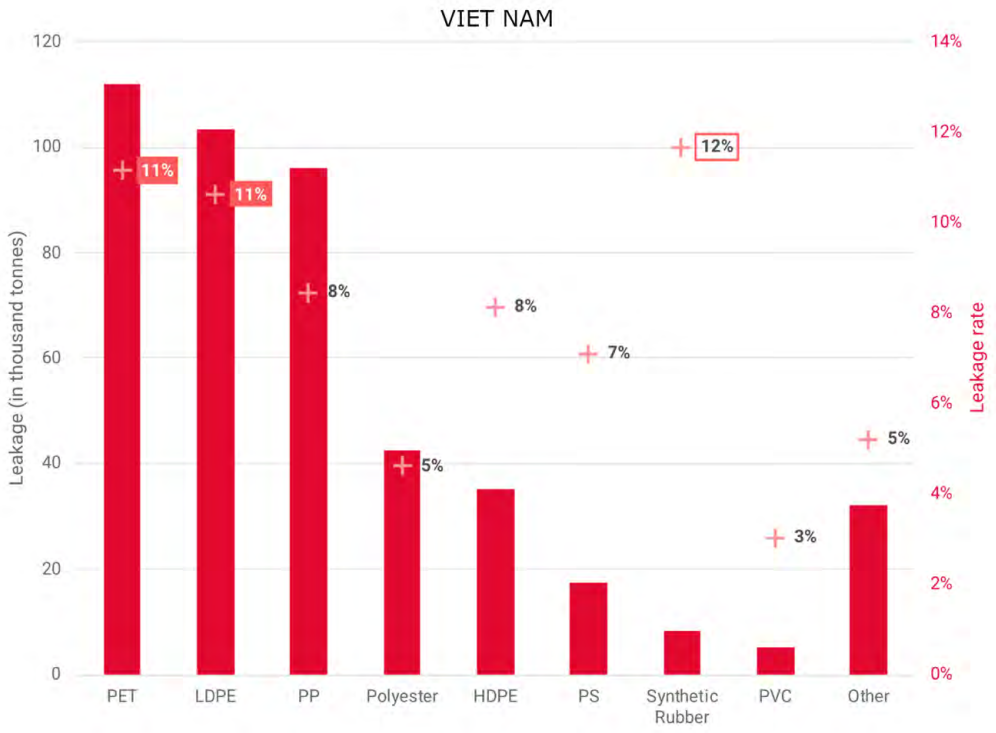



**Figure 3.** Polymer hotspots across the eight pilot assessments. In Eastern and Southern Africa, polypropylene (PP), low-density polyethylene (LDPE) and polyethylene terephthalate (PET) were the most common polymers identified. In the Mediterranean, between the two islands, LDPE, PET, PP, and synthetic rubber (from tyres) contributed the most polymer leakage. In Southeast Asia, the research showed that LDPE, PP, PET, and polyester were the most common polymers leaking into the environment. Source: National guidance for plastic pollution hotspotting and shaping action, pilot reports. *Source: IUCN et al., 2020.*

**Table 3.** Polymer hotspots, summary by assessment results. The key takeaways are shared for each pilot location. Note that the polymers vary by location.

| Location | | Polymer hotspots | Key takeaways |
|---|---|---|---|
| **Eastern and Southern Africa** | **Kenya** | **PP** is the top contributor in absolute leakage (9.4 kt), with a leakage rate of 9%.<br>**PET** is the third highest contributor to leakage (5.1 kt), with a leakage rate of 12%. | PP is the second highest polymer for waste generation in Kenya (the first being polyester), and half of this PP waste comes from the packaging sector (which has a high release rate). Only 6% of the PP that went to waste in 2018 was collected for recycling.<br>**PET** is the top leaking polymer by relative leakage because it is almost exclusively used in the packaging sector. Packaging corresponds to 40% of the total waste produced in the country and causes 55% of the country's leakage. Thirteen per cent of PET is collected for recycling. |

| | | | |
|---|---|---|---|
| Eastern and Southern Africa | Mozambique | **PET** is the top contributor in absolute leakage (5.7 kt), with a leakage rate of 13%.<br><br>**PP** follows PET with 3.2 kt of leakage. | **PET** is the polymer with the highest waste generation, and it is mostly used in packaging. Even though it is one of the polymers most likely to be collected for recycling, only 2% of the PET disposed of in Mozambique is collected for recycling due to lack of value chains and government incentives for plastic recycling industry in the country.<br>**PP** is the most consumed polymer in Mozambique, but out of the 48 kt of PP put on the market, a third becomes stock, embedded in long-lived products. Out of 35 kt that became waste in 2018, none was recycled. The lack of recycling together with the high mismanagement rate causes PP to be the second most leaked polymer by absolute leakage. This makes it a priority hotspot to tackle in the country. |
| | South Africa | **LDPE** is the top contributor in absolute leakage (23 kt), with a leakage rate of 5%.<br>**PP** and **PET** follow with 22 kt and 18 kt of leakage, respectively. PET has a leakage rate of 6%. | **LDPE** is the top leaking polymer by absolute and relative leakage because almost 70% is used in the packaging sector, where products are more likely to leak (the release rate is 15% for packaging items in South Africa). In 2018, 23 kt of LDPE leaked into the ocean and main rivers.<br>Although **PP** waste generation is the same as for LDPE (468 kt), it ranks second for leakage mainly because only half of this PP waste comes from the packaging sector, which has a higher release rate than most other sectors. |
| | United Republic of Tanzania | **PP** is the top leaking polymer by absolute leakage with 7.1 kt of leakage.<br>**PET** is the main hotspot because it has both a high absolute leakage (4.7 kt) and relative leakage (12%).<br>**Polyester** has the second most generated plastic waste with 59 kt in 2018. | **PP** is the polymer with the highest waste generation. Only 1 tonne of PP is collected for recycling, which corresponds to around 1% of the plastic waste generated. Therefore, since there is no proper disposal of waste in Tanzania, 99% of PP waste is mismanaged.<br>As **PET** is one of the most recycled types of polymer, with 9 kt collected for recycling, most of which is exported, it is less mismanaged than other polymers, with an MWI of 78%. However, since PET is mostly used in packaging for on-the-go items, it is very likely to be released into waterways and the ocean.<br>There is no recycling of **polyester**, and because it is used in the textile, automotive and engineering sectors, its leakage rate is lower than other polymers – "only" 3.4 kt of polyester leak to the ocean and waterways. |
| Mediterranean | Menorca, Spain | **LDPE** is the top contributor in absolute leakage (22 t), with a leakage rate of 1%.<br><br>**PET** and **PP** follow with 18 t and 13 t of leakage respectively, with a leakage rate of 1% and 0.5% respectively.<br><br>Although **synthetic rubber** ranks low in absolute leakage (5 t), 2% of its generated waste leaks into the ocean and waterways, especially due to microleakage from tyre abrasion. | **LDPE** is mostly used in the packaging sector, and packaging items tend to have a higher chance of being littered and released to the sea.<br><br>Twenty-six per cent of **PET** is exported for recycling. Nonetheless, because PET is almost exclusively used in packaging and the packaging of on-the-go items has a higher chance of leaking to the environment, there are still 18 t of PET leaking to the sea.<br><br>Of the 283 t of **synthetic rubber** waste estimated to be generated in Menorca in 2018, only 25 t were recorded as being disposed of in waste management facilities in Menorca, for recycling. It was assumed that the remaining non-littered synthetic rubber was as likely as other waste to be collected, but there is no actual insight on where this waste might be disposed of. |

| | | | |
|---|---|---|---|
| | Republic of Cyprus | **Synthetic rubber** is the top contributor in absolute plastic leakage (188 t), with the highest leakage rate (2%).<br><br>**PET** is next, with an absolute plastic leakage of 112 t and a leakage rate of 1.3%.<br><br>**LDPE** and **HDPE** follow closely with respectively 115 t and 114 t of plastic leakage. | Leakage from **synthetic rubber** is substantial in the Republic of Cyprus. Indeed, the leakage from automotive tyres is equivalent to around 50% of that of the packaging sector (see sector hotspots below) when for some other pilot locations, this figure remains below 5%. Thus, synthetic rubber leaks more than other polymers, which are used in multiple sectors.<br><br>Even though the total quantity of **PET** waste generated in the country is lower than that of either HDPE or LDPE, its contribution to leakage is larger, thus placing it just below synthetic rubber. This is for two reasons: first, PET has the lowest collection rate among all polymers, and hence a higher mismanagement rate. And secondly, PET has the highest release rate once mismanaged, which means that in the Republic of Cyprus, PET is more likely to end up in waterways than HDPE or LDPE.<br><br>Though **LDPE** and **HDPE** are the polymers with the highest waste generation, they are more recycled and less mismanaged than PET. |
| Southeast Asia | Thailand | **LDPE** is the top contributor in absolute leakage (144 kt), with a leakage rate of 9%. **HDPE** is the next highest contributor to leakage (54 kt), with a leakage rate of 7%.<br><br>**Polyester**, extensively used in textiles, is the third polymer by absolute leakage (34 kt).<br><br>**Synthetic rubber** is a hotspot due to its high relative leakage (7%). | **LDPE** is widely used in Thailand to make plastic bags, which in some places constitute more than 60% of all plastics found at landfills/dumpsites, and there is very little recycling of LDPE in Thailand (WWF, 2020). One explanation could be that informal collectors are reluctant to transport plastic bags as these are light and voluminous items. Large amounts of waste generated and a lack of recycling, combined with LDPE's use in light packaging applications (with a high release rate), make it the top polymer hotspot for plastic leakage in Thailand.<br><br>**Polyester** is the single most produced polymer for the textile market in Thailand. Around 700 kt of polyester fibre waste was generated in 2018, of which 66% was mismanaged. This was mainly due to insufficient capacity of sanitary landfills, leading to more than 30% of the collected polyester fibre waste to be disposed of at unsanitary landfills or dumpsites, and 30% remaining uncollected. There is no recycling of polyester fibre in Thailand.<br><br>**Synthetic rubber** from tyres leaks to the environment because of waste mismanagement (amounting to macro-leakage of 11 kt), but also because of tyre abrasion (micro-leakage of 10 kt). Microplastics from tyre abrasion increase the total leakage, leading to a high leakage rate with respect to other polymers. |
| | Viet Nam | **PET** is the top contributor in absolute leakage (112 kt), with a leakage rate of 11%. More than a tenth of PET put on the market leaks to the ocean.<br><br>**LDPE** and **PP** follow with 103 kt and 96 kt of leakage, respectively. | **PET** is one of the polymers most likely to be collected by the informal sector for recycling (because of its high value for waste pickers and the fact that PET bottles are easily recognisable). Nonetheless, it is also one of the polymers most likely to be littered and leaked (high release rate).<br><br>The **LDPE** that is recycled comes mainly from imported rather than domestic waste. LDPE waste generated in Viet Nam is not recycled, as it has no value for the informal recycling sector.<br><br>Of the 1.5 Mt of **PP** put on the market, 33% goes to stock, embedded in long-lived products, while around 1.1 Mt becomes waste. The low recycling rate of PP and the general mismanagement of waste in Viet Nam makes PP one of the top polymers by absolute leakage. |

*Source: National guidance for plastic pollution hotspotting and shaping action, pilot reports. (IUCN et al., 2020)*

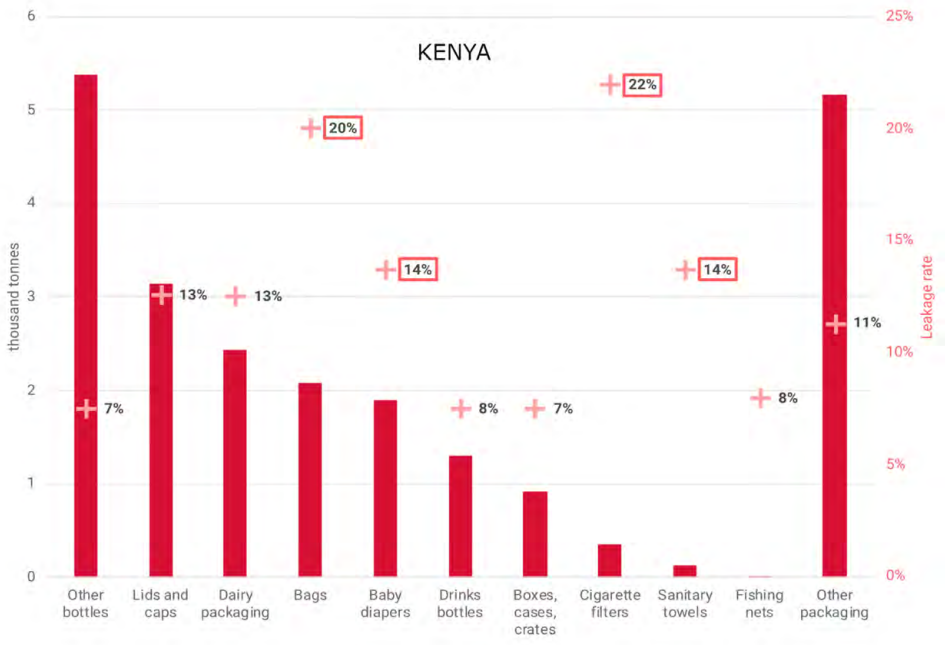
## 2.5. Application hotspot summary

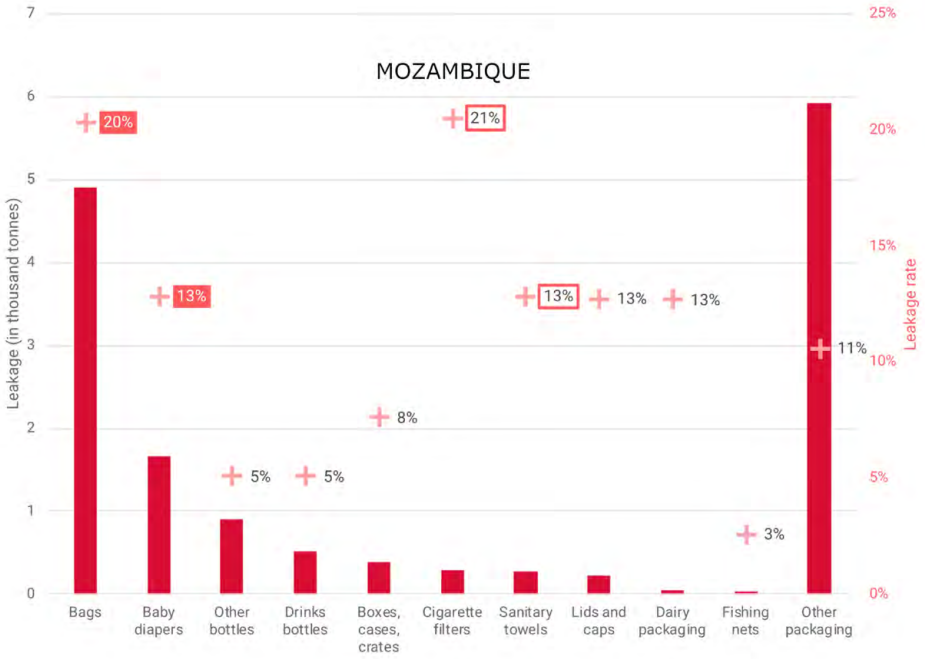
An application hotspot is one in which a use of plastic (such as carrier bags, bottles, lids, or other packaging) shows up in the data analysis as contributing to plastic waste, and its rates of leakage contribute significantly to plastic pollution.

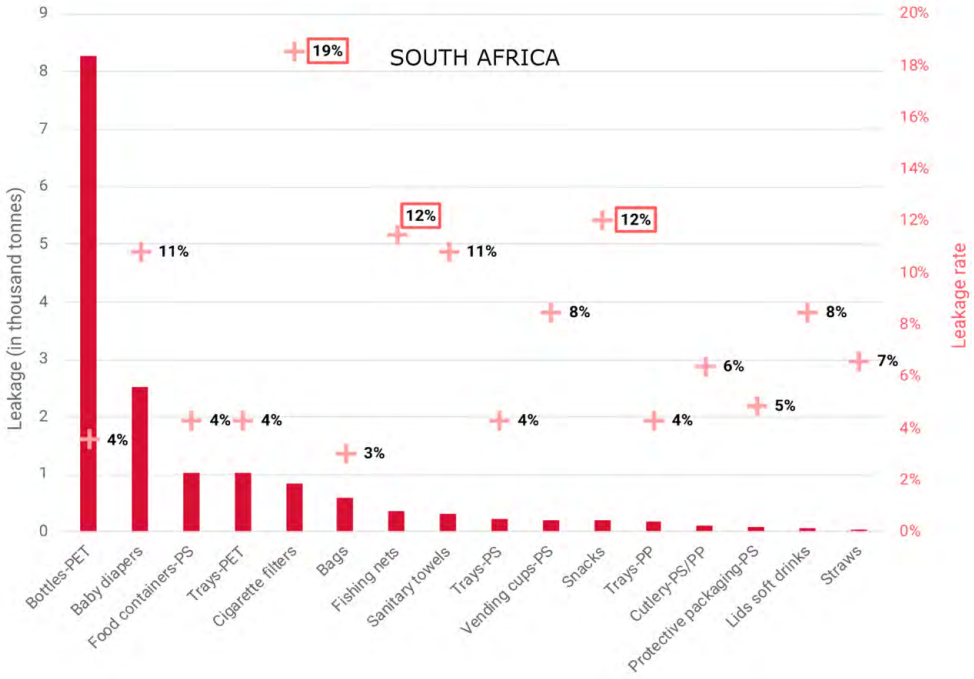
In Eastern and Southern Africa, drinking and non-drinking bottles, bags, lids, and fishing gear were found to be hotspots. Interestingly, the banning of bags that use a given type of polymer has not stemmed the flow of plastic bags to the ocean. For example, as PP bags were not banned in Kenya, they have taken the place of LDPE bags, which were banned in 2017 (Pucino et al., 2020). Another key finding is that continuous efforts on plastic bag regulations in South Africa have paid off, with plastic bags not regarded as a hotspot in the national analysis.

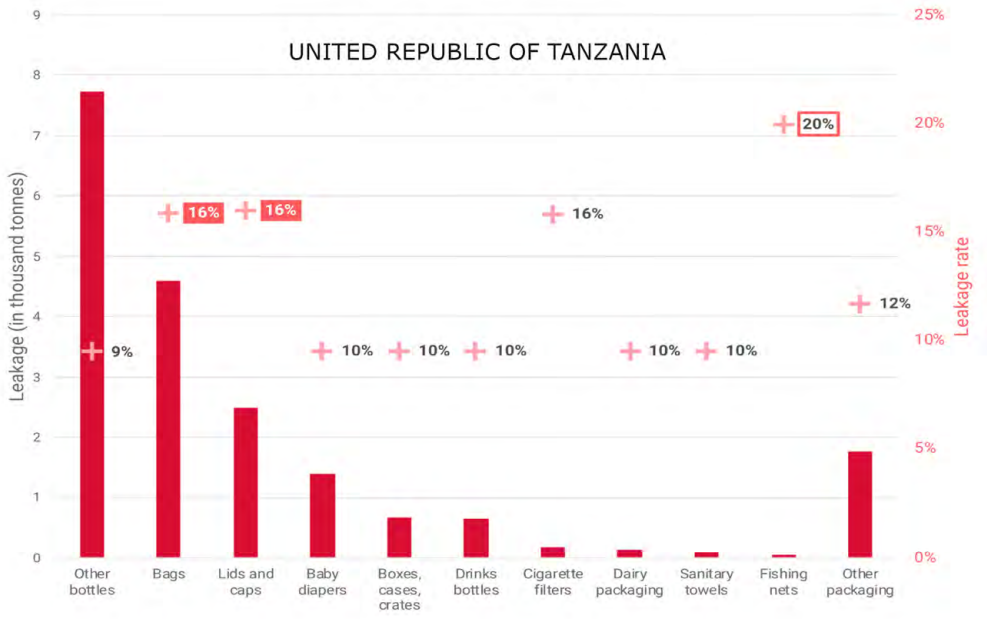
In the Mediterranean, data for Menorca did not allow for modelling on application hotspots, so the data presented in Figure 9 is only for the Republic of Cyprus. Bags, lids and caps, and fishing nets were the top three application hotspots.

For Southeast Asia, in Thailand bags are the main application hotspot and are followed in the ranking by the category of "boxes, cases, crates", an additional set of short-lived, single-use applications. Bottles are the second most common plastic packaging application on the market, according to WWF estimates (2020); 70% of all bottles going to waste are collected for recycling. Figure 4 and Table 4 set out more of the application hotspots and key takeaways.




MOZAMBIQUE
Leakage (in thousand tonnes)
Leakage rate
0
1
2
3
4
5
6
7
0%
5%
10%
15%
20%
25%
20%
21%
13%
13%
13%
13%
11%
8%
5%
5%
3%
Bags
Baby diapers
Other bottles
Drinks bottles
Boxes, cases, crates
Cigarette filters
Sanitary towels
Lids and caps
Dairy packaging
Fishing nets
Other packaging


SOUTH AFRICA
Leakage (in thousand tonnes)
Leakage rate
0
1
2
3
4
5
6
7
8
9
0%
2%
4%
6%
8%
10%
12%
14%
16%
18%
20%
19%
12%
12%
11%
11%
8%
8%
7%
6%
5%
4%
4%
4%
4%
4%
3%
Bottles-PET
Baby diapers
Food containers-PS
Trays-PET
Cigarette filters
Bags
Fishing nets
Sanitary towels
Trays-PS
Vending cups-PS
Snacks
Trays-PP
Cutlery-PS/PP
Protective packaging-PS
Lids soft drinks
Straws


UNITED REPUBLIC OF TANZANIA
Leakage (in thousand tonnes)
Leakage rate
0
1
2
3
4
5
6
7
8
9
0%
5%
10%
15%
20%
25%
9%
16%
16%
10%
10%
10%
16%
10%
10%
20%
12%
Other bottles
Bags
Lids and caps
Baby diapers
Boxes, cases, crates
Drinks bottles
Cigarette filters
Dairy packaging
Sanitary towels
Fishing nets
Other packaging

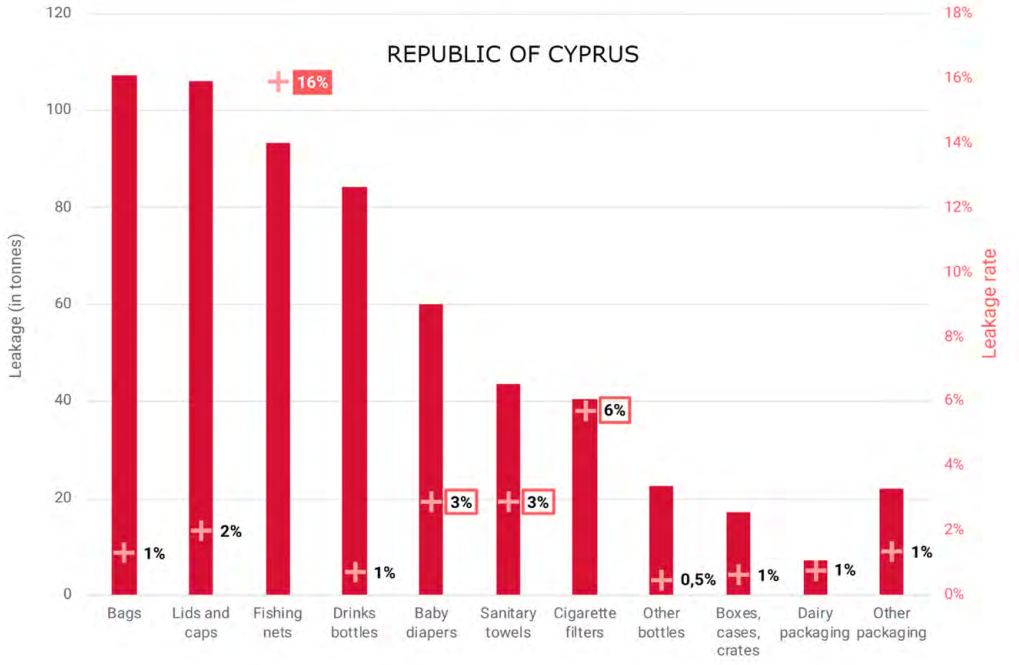

REPUBLIC OF CYPRUS
Leakage (in tonnes)
Leakage rate
0
20
40
60
80
100
120
0%
2%
4%
6%
8%
10%
12%
14%
16%
18%
1%
2%
16%
1%
3%
3%
6%
0,5%
1%
1%
1%
Bags
Lids and caps
Fishing nets
Drinks bottles
Baby diapers
Sanitary towels
Cigarette filters
Other bottles
Boxes, cases, crates
Dairy packaging
Other packaging


**Figure 4.** Application hotspots across the eight pilot countries. In Eastern and Southern Africa, drinking and non-drinking bottles, bags, lids, and fishing gear were found to be hotspots. In the Mediterranean, data for Menorca did not allow for modelling on application hotspots, so the data presented in Figure 9 is only for the Republic of Cyprus. Bags, lids and caps, and fishing nets were the top three application hotspots there. For Southeast Asia, in Thailand bags are the main application hotspot and are followed in the ranking by the category of "boxes, cases, crates", an additional set of short-lived, single-use applications. Source: National guidance for plastic pollution hotspotting and shaping action, country reports. *Source: IUCN et al., 2020.*

**Table 4.** Application hotspots, with examples and key takeaways for the eight pilot locations.

| | | Examples of application hotspots | Key takeaways |
|---|---|---|---|
| Eastern and Southern Africa | Kenya | **Other bottles** (non-drinking bottles) are the highest contributors in absolute leakage (5.4 kt).<br>**Lids and caps and diary packaging** are the second and third highest contributors in absolute leakage (3.1 kt and 2.4 kt, respectively).<br>**Plastic bags** are a hotspot because of their high leakage rate (20%). | Only 27% of the plastic waste generated in Kenya is collected: 8% collected for recycling and the remaining 19% disposed of in unsanitary landfills or dumpsites.<br>Although LDPE **plastic bags** were banned in Kenya in 2017, and the subject of heavy fines, in 2018 there was still some import and export of plastic bags, as declared by Kenyan customs to the UN trading body (Comtrade code 392321, 392322). Nonetheless, the trade of plastic bags fell from 16 kt in 2016, before the ban, to 3 kt in 2018, after the ban (United Nations, 2020), a drop of 80%. |
| | Mozambique | **Plastic bags** are by far the highest contributor in absolute leakage (4.9 kt) and rank second in leakage rate (20%). | **Plastic bags** should be monitored, and bans should be investigated for implementation. There is a small amount of domestic production of plastic in Mozambique; most plastic consumed is imported. Around 17 kt of plastic waste leaks into rivers and the ocean annually. This means that 10% of plastic waste generated is leaking into the marine environment. |
| | South Africa | Based on known products, **PET bottles** are the biggest hotspot in terms of absolute leakage. This is explained by their large plastic waste input, representing 9% of all plastic waste on their own. | While PETCO reported that 98,649 t of **PET bottles** were recycled in 2018, the equivalent figure reported by Plastics SA was only 74,328 t. For data consistency across all polymers, this research used values from Plastics SA (2019). |
| | United Republic of Tanzania | **Other bottles (non-drinking bottles)** have the highest absolute leakage at 7.7 kt.<br>**Fishing nets** have only a small contribution to the country's plastic leakage (0.05 kt) but, due to gear loss at sea, 20% of the fishing gear in use leaks into the environment. | The broadness of the **other bottles** category means that it is difficult to identify which applications are most responsible for leakage. Used **fishing gear** is not easily recuperated and thus often ends up leaking into the environment. |
| Mediterranean | Menorca, Spain | Sufficient data unavailable. | |
| | Republic of Cyprus | **Plastic bags** are just ahead of **lids and caps** as top contributors to plastic leakage with 107 t and 106 t, respectively.<br><br>**Fishing nets** rank third in absolute leakage (84 t) but first in leakage rate, at 16%. | **Plastic bags** are the application responsible for the most leakage (among those covered in the analysis) in the Republic of Cyprus as it is the second most used application in the country and has high release potential in waterways after loss. **Fishing** ranks as the third highest sector by absolute plastic leakage and the first by leakage rate. This can be explained by the prevailing use of longlines, which have the highest plastic weight by unit as well as the highest chance of being lost at sea (Richardson et al., 2019) |

| | | | |
|---|---|---|---|
| Southeast Asia | Thailand | **Plastic bags** are by far the highest contributors in absolute leakage (113 kt) and rank third in leakage rate (11%). | One million tonnes of **plastic bags** were put on the Thai market in 2018 and went to waste. That is equivalent to eight plastic bags being discarded by a single person every day. In 2018, recycling of plastic bags was limited to 7 kt, 260 kt were properly disposed of, and 733 kt were mismanaged (representing an MWI of 73%). The assessment showed that 113 kt of plastic bags leak to the ocean every year, making plastic bags the main application hotspot. |
| | Viet Nam | **Plastic bags** are by far the highest contributors in absolute leakage (244 kt) and rank second in leakage rate (12%).<br><br>**Lids and caps** are second in absolute leakage (18 kt) and also have a 12% leakage rate like bags.<br><br>Although **fishing nets** rank low in absolute leakage (1 kt), almost one sixth of the waste generated tends to leak into the ocean. | IUCN found no data available on production quantities by application type in Viet Nam. The production quantities have thus been estimated. This represents a big assumption, and it seems not to be valid for Viet Nam: the method leads to an estimate of more than 2 Mt of plastic bags going to waste, when the LDPE waste (of which plastic bags are usually made) amounts to around 1 Mt. Hence, it seems that the import and export data used are not representative of domestic production, and therefore there is no insight on application production in Viet Nam. |

*Source: National guidance for plastic pollution hotspotting and shaping action, pilot reports. (IUCN et al., 2020)*

## 2.6. Sector hotspot summary

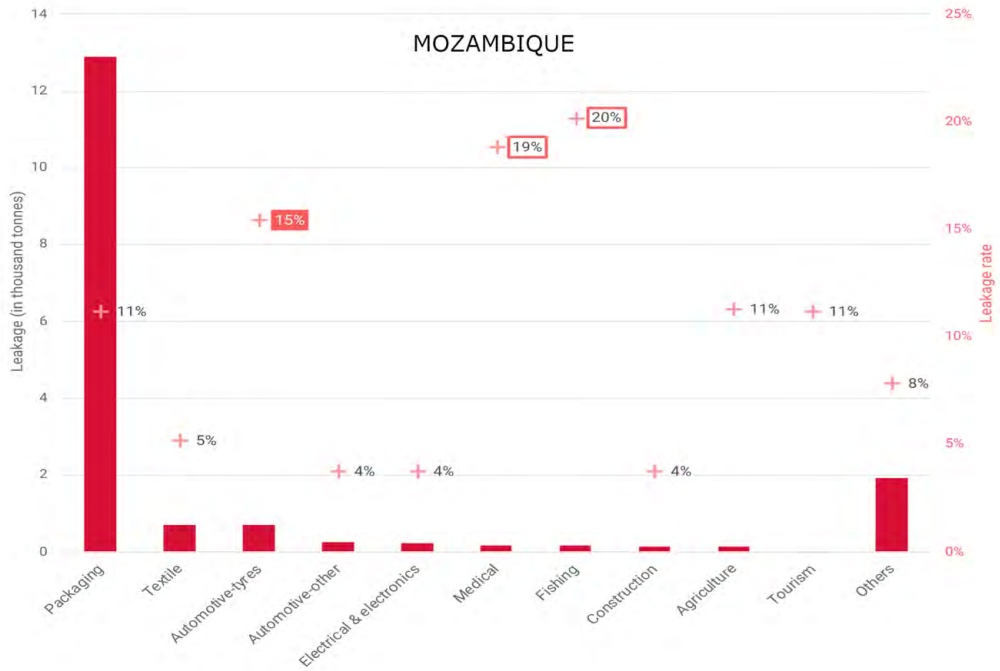
Packaging, textiles, fishing, medical, and automotive tyres are the main sectoral contributors to plastic leakage in Eastern and Southern Africa. However, as across all eight pilot areas, the packaging sector contributed the most plastic leakage, followed by the textile and automotive-tyre sectors (Pucino et al., 2020). In the four pilot countries in Eastern and Southern Africa, the research showed that packaging causes between 50% (in Kenya) and 70% (in Mozambique) of the total plastic leakage. Packaging is the sector with the highest plastic consumption and, unlike other sectors, all of the products in the packaging sector become waste within a year.

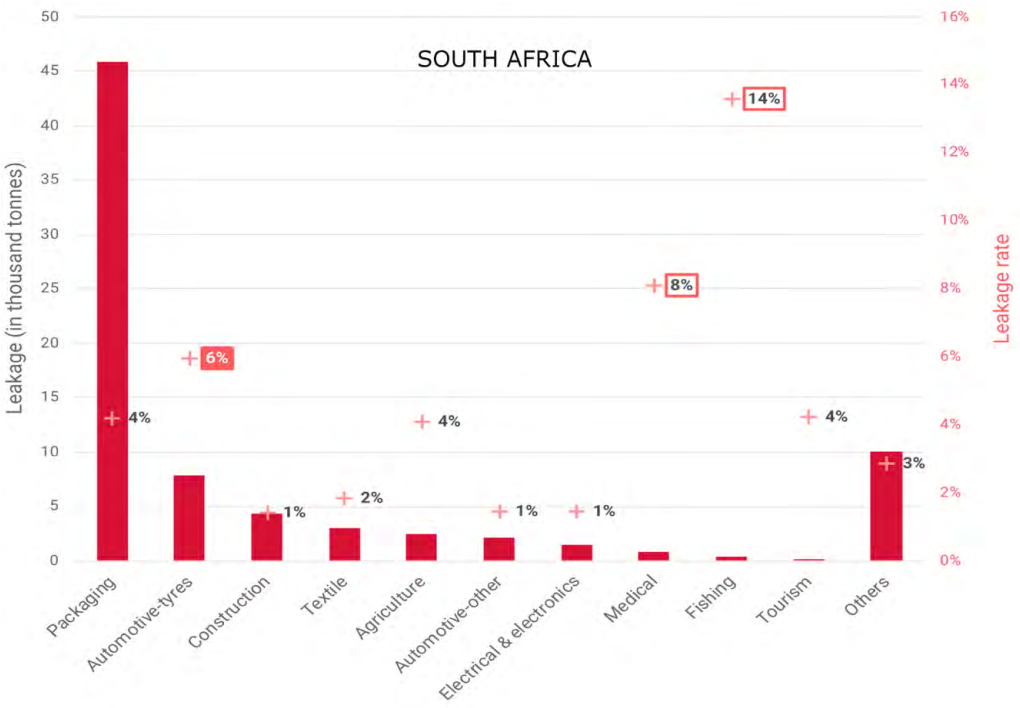
In the Mediterranean, the main sector hotspots in the Republic of Cyprus are similar to those of other regions, with the packaging sector responsible for most of the plastic leakage, followed by automotive tyres. The fishing and tourism sectors closely follow, even though they often only contribute minimally in other locations in the region. In Menorca, the tourism sector is as much a critical hotspot as the packaging industry, each contributing more than one fifth of the total plastic leakage. The automotive-tyre sector follows as a leakage hotspot.

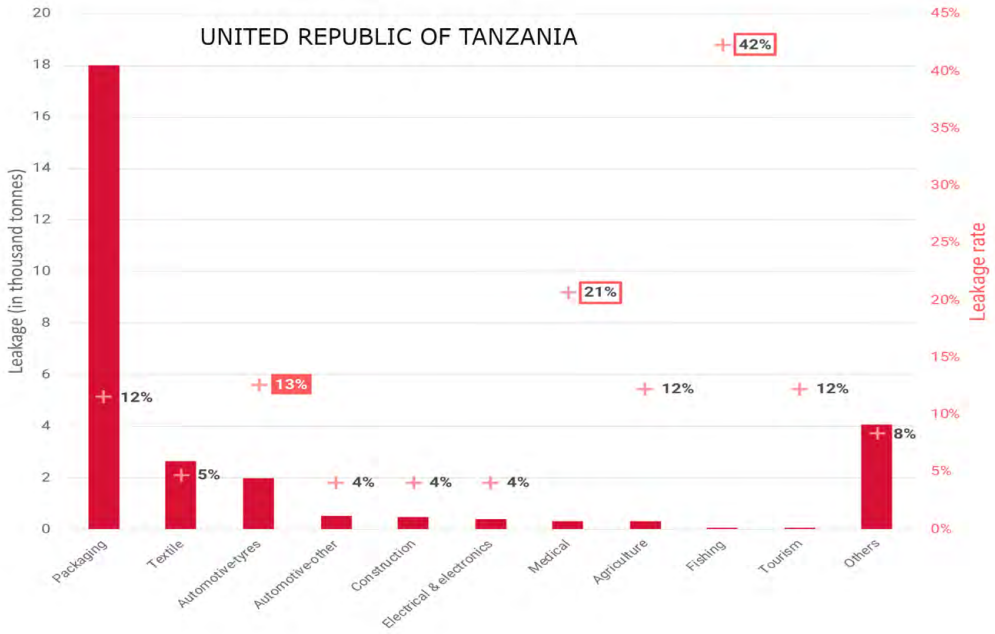
In Southeast Asia, sector hotspots show that packaging is contributing to the majority of plastic leakage, followed by the textile and automotive-tyre sectors, except for Viet Nam, where the automotive-tyre sector is not a hotspot. This is because there is a lack of data regarding the production of synthetic rubber in Viet Nam. This likely leads to an underestimation of the production of synthetic rubber and the plastic leakage contributed by the automotive-tyre sector, by extension.

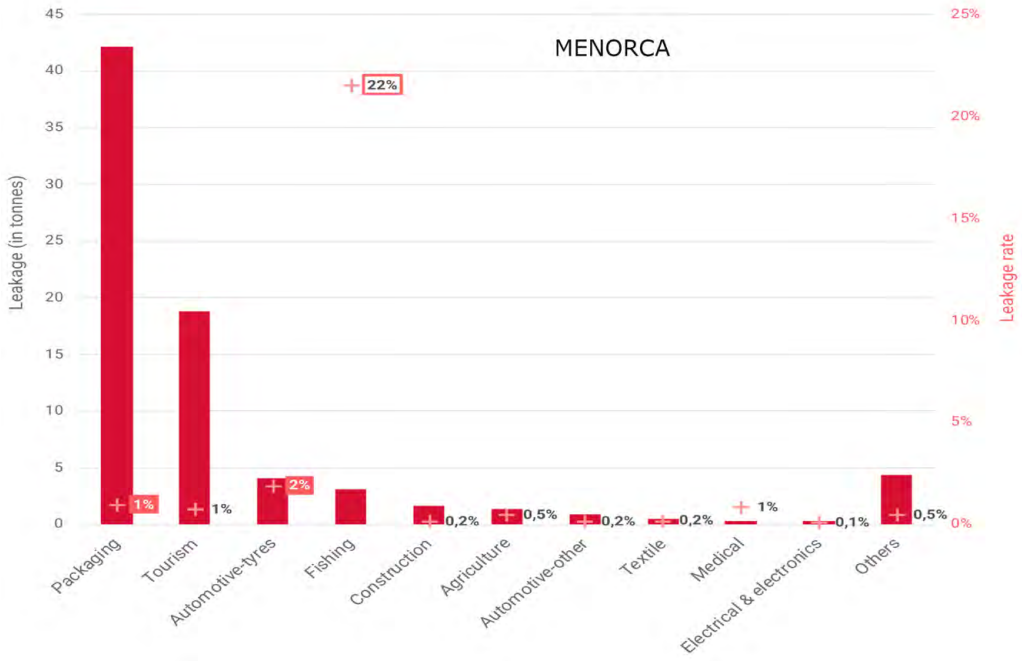
Figure 5 and Table 5 demonstrate various sectors' contributions to plastic leakage.

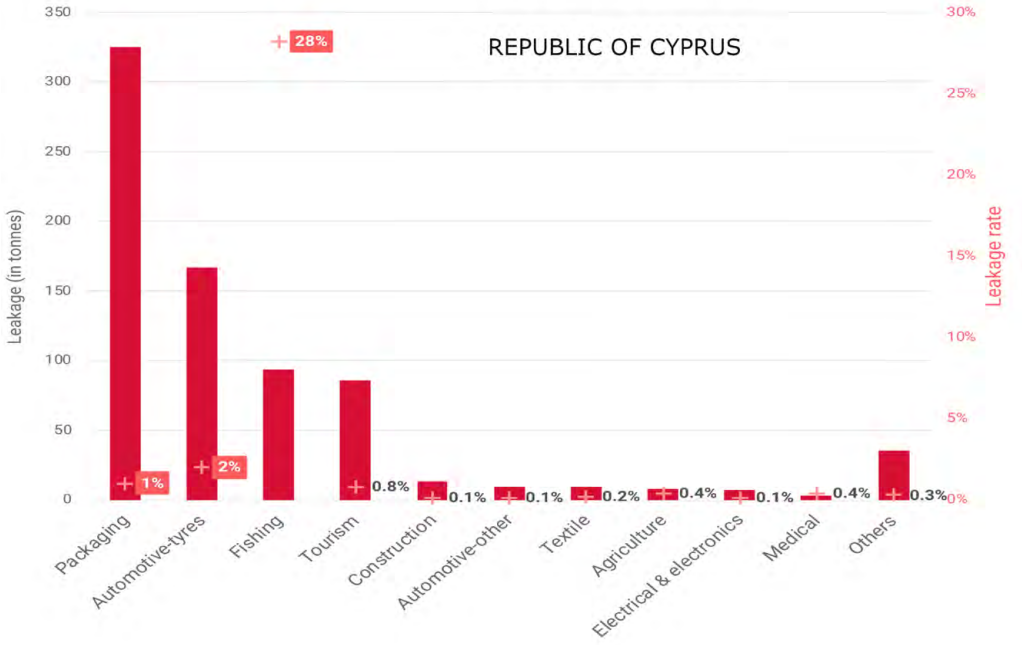

KENYA
thousand tonnes
Leakage rate
25
20
15
10
5
0
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
10%
4%
7%
3%
3%
3%
19%
10%
12%
10%
7%
Packaging
Textile
Automotive-tyres
Construction
Automotive-other
Agriculture
Electrical & electronics
Medical
Tourism
Fishing
Others


MOZAMBIQUE
Leakage (in thousand tonnes)
Leakage rate
14
12
10
8
6
4
2
0
25%
20%
15%
10%
5%
0%
11%
5%
4%
4%
15%
19%
20%
4%
11%
11%
8%
Packaging
Textile
Automotive-tyres
Automotive-other
Electrical & electronics
Medical
Fishing
Construction
Agriculture
Tourism
Others


SOUTH AFRICA
Leakage (in thousand tonnes)
Leakage rate
50
45
40
35
30
25
20
15
10
5
0
16%
14%
12%
10%
8%
6%
4%
2%
0%
4%
6%
1%
2%
4%
1%
1%
8%
14%
4%
3%
Packaging
Automotive-tyres
Construction
Textile
Agriculture
Automotive-other
Electrical & electronics
Medical
Fishing
Tourism
Others


UNITED REPUBLIC OF TANZANIA
Leakage (in thousand tonnes)
Leakage rate
20
18
16
14
12
10
8
6
4
2
0
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
12%
5%
13%
4%
4%
4%
21%
12%
42%
12%
8%
Packaging
Textile
Automotive-tyres
Automotive-other
Construction
Electrical & electronics
Medical
Agriculture
Fishing
Tourism
Others


MENORCA
Leakage (in tonnes)
Leakage rate
45
40
35
30
25
20
15
10
5
0
25%
20%
15%
10%
5%
0%
22%
1%
1%
2%
0,2%
0,5%
0,2%
0,2%
1%
0,1%
0,5%
Packaging
Tourism
Automotive-tyres
Fishing
Construction
Agriculture
Automotive-other
Textile
Medical
Electrical & electronics
Others


REPUBLIC OF CYPRUS
Leakage (in tonnes)
Leakage rate
350
300
250
200
150
100
50
0
30%
25%
20%
15%
10%
5%
0%
28%
1%
2%
0.8%
0.1%
0.1%
0.2%
0.4%
0.1%
0.4%
0.3%
Packaging
Automotive-tyres
Fishing
Tourism
Construction
Automotive-other
Textile
Agriculture
Electrical & electronics
Medical
Others

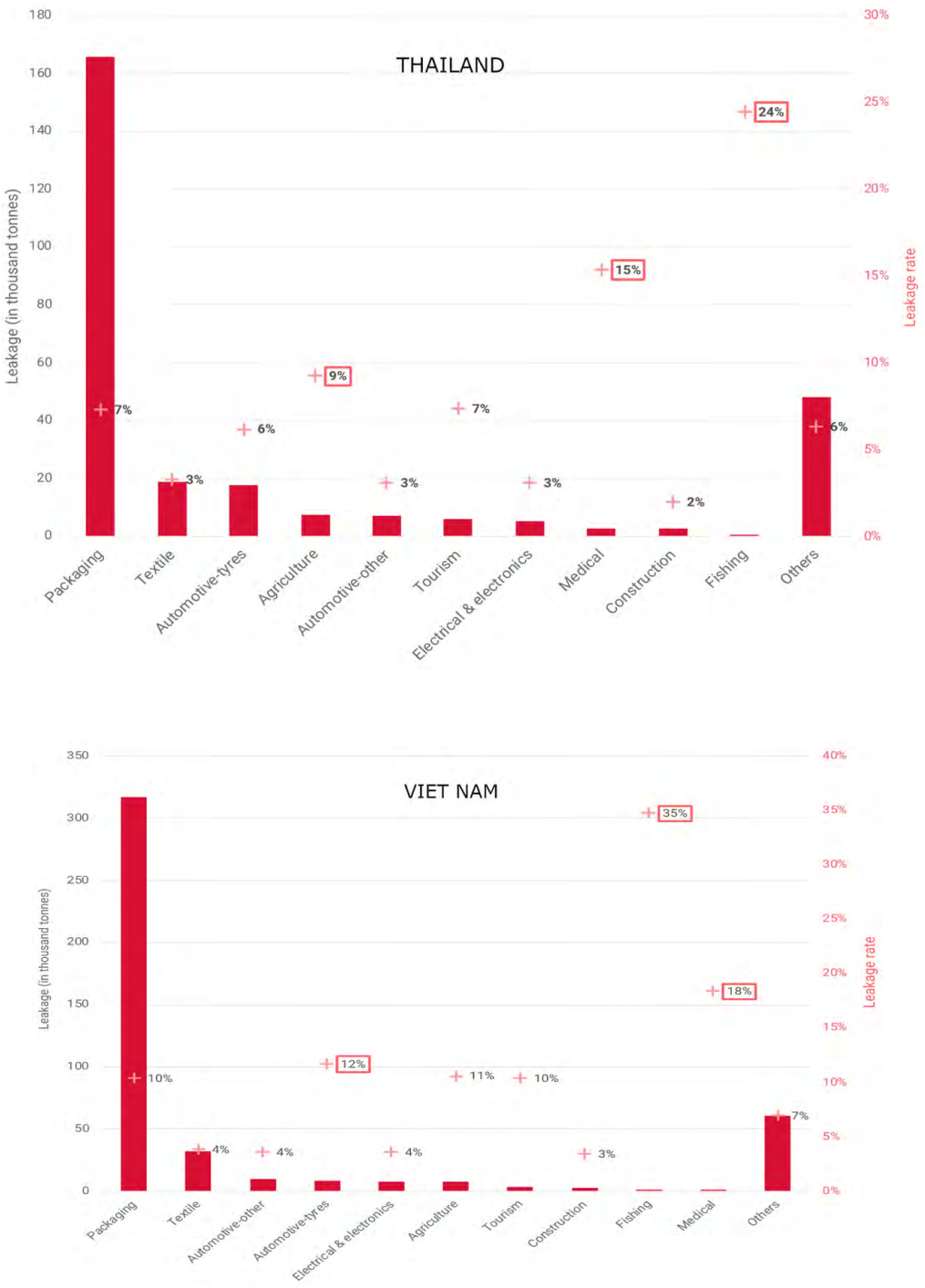



**Figure 5.** Sector hotspots across the eight pilots. Packaging, textiles, fishing, medical, and automotive tyres are the main sectoral contributors to plastic leakage. However, as across all eight pilot areas, the packaging sector contributed the most plastic leakage, followed by the textile and automotive-tyre sectors (Pucino et al., 2020). In the four pilot countries in Eastern and Southern Africa, the research showed that packaging causes between 50% (in Kenya) and 70% (in Mozambique) of the total plastic leakage. Packaging is the sector with the highest plastic consumption and, unlike other sectors, all of the products in the packaging sector become waste within a year. Sources: National guidance for plastic pollution hotspotting and shaping action, pilot reports. *(IUCN et al., 2020)*

**Table 5.** Selected sector hotspots and key takeaways for the eight pilot locations.

| | | Selected sector hotspots | Key takeaways |
|---|---|---|---|
| Eastern and Southern Africa | Kenya | The **packaging sector** contributes to more than 50% of total plastic leakage with 20.3 kt of packaging waste leaking into the ocean and waterways.<br><br>The **medical sector** has a low contribution in absolute leakage but has high leakage rate, at 19%. | Most of the plastic collected for recycling in Kenya comes from the **packaging** sector, yet this represents only 9% of the total of plastic packaging production in the country.<br>**Medical waste** appears to have high relative leakage and low absolute leakage. The high relative leakage is most likely not accurate, as it is assumed that there is special treatment of medical waste, as should be the case in most countries, with the majority of the medical waste being incinerated. |
| | Mozambique | The **packaging sector** contributes more than 70% of the total plastic leakage with 12.9 kt of packaging waste leaking into the ocean and waterways.<br><br>The **textile** and **automotive-tyre sectors** are jointly the next highest contributors to plastic leakage in absolute value (0.7 kt each). | Almost all plastics collected for recycling in Mozambique come from the **packaging** sector.<br><br>Plastic embedded in **textiles** is not recycled, but the overall relative leakage is smaller because of the lower likelihood of littering and lower release rate with regard to packaging.<br><br>The high relative leakage from **tyres** in Mozambique is due to the micro-leakage coming from tyre abrasion. |
| | South Africa | The **packaging sector** contributes almost 60% of total plastic leakage with 63 kt of packaging waste leaking into the ocean and waterways.<br><br>**Fishing** has a low contribution in absolute leakage but has a high leakage rate of 14%. | **Packaging** is the sector with the highest plastic consumption and, unlike other sectors, all of the products in the packaging sector become waste within a year.<br><br>**Fishing** gear loss and leakage is minor in South Africa and does not represent a critical sector hotspot. Some advanced measures are already taken to retrieve lost gear, such as voluntary gear marking, but many recommendations still need to be enforced in order to reduce the high leakage rate. |
| | United Republic of Tanzania | The **packaging sector** is responsible for 62% of the total country leakage, with 18 kt.<br><br>The **fishing sector** has the highest leakage rate, at 42%. | Almost all plastics collected for recycling in Tanzania come from the **packaging** sector.<br><br>Leakage from **fishing** includes leakage from gear loss at sea, leakage from overboard littering, and leakage from fishing gear mismanaged on land. |
| Mediterranean | Menorca, Spain | The **packaging sector** contributes 40% of the total plastic leakage with 42 t of packaging waste leaking.<br><br>The **tourism sector** is the second highest contributor to plastic leakage in absolute value (19 t).<br><br>The **automotive-tyre sector** ranks third in absolute leakage (5 t) and second in relative leakage (2%) due almost entirely to microplastic leakage from tyre abrasion.<br><br>The **fishing sector** has the highest leakage rate (22%). | Most of the plastic waste generated in Menorca comes from the **packaging sector**. In 2018, 5,618 t of plastic waste from packaging were generated.<br>The **tourism sector** accounts for 22% of all waste in Menorca, with almost 2,500 t of waste generated from tourist-related activities.<br>Micro-leakage contributes 7% of the overall plastic leakage. This is mainly due to tyre dust from abrasion during road transportation.<br>Four tonnes of **fishing gear** were estimated to be lost at sea in Menorca in 2018. This amounts to 6% of the total country leakage. |

| | | | |
|---|---|---|---|
| | Republic of Cyprus | The **packaging sector** contributes 42% of total plastic leakage with 325 t of packaging waste leaking into the ocean and waterways.<br><br>The **automotive-tyre sector** is the second highest contributor to plastic leakage in absolute value (167 t), mostly due to tyre abrasion on roads.<br><br>The **tourism sector** accounts for 86 t of plastic leakage in the Republic of Cyprus. | **Packaging** is the sector with the highest plastic consumption and, unlike other sectors, all the products in the packaging sector become waste within the year.<br><br>The high leakage from the **automotive-tyre sector** is due to the micro-leakage coming from tyre abrasion while driving vehicles on roads.<br><br>The leakage from the **tourism sector** does not come as a surprise since Cyprus is a very attractive destination, with almost 4 million tourists in 2018. It was assumed that the tourism sector has an impact on every other sector that is proportional to the waste generated in each sector. |
| Southeast Asia | Thailand | The **packaging sector** contributes almost 60% of the total plastic leakage with 166 kt of packaging waste leaking.<br><br>The **fishing sector** has a relatively low contribution in absolute leakage but a very high leakage rate (24%). | The **packaging sector** is a driver of leakage due to its high plastic consumption, the highest for all sectors. This is in part counterbalanced by the fact that most of the recycled plastic comes from the packaging sector: 69% of plastic used for packaging is collected.<br>The **fishing sector** contributes to leakage due to the widespread practice among fishers of throwing waste overboard. Around 50% of the leakage related to fishing comes from overboard littering of plastic packaging. Loss of fishing gear and improper disposal of fishing gear on land contribute to the remaining 50%. |
| | Viet Nam | The **packaging sector** contributes 70% of the total plastic leakage with 317 kt of packaging waste leaking.<br><br>**The fishing sector** has a low contribution in absolute leakage but has very high leakage rates (35%). | Most of the plastic collected for recycling in Viet Nam comes from the **packaging sector** yet it amounts to only 8% of the entire production of plastic packaging.<br><br>**Fishing** has the highest relative leakage, due to the widespread practice by fishers of throwing waste overboard. Loss of fishing gear and improper disposal of fishing gear on land are also considered in this study, but they do not represent a big share of the absolute plastic leakage of the country. The fishing sector does not include fish markets. |

*Source: National guidance for plastic pollution hotspotting and shaping action, pilot reports. (IUCN et al., 2020)*

## 2.7. Geographic hotspot summary

The UNEP/IUCN National Guidance and tools also provide a pre-computed GIS model to facilitate the generation of maps to illustrate geographical results.

In the Eastern and Southern Africa region, most plastic leakage was found to occur inland, in the main cities, other inland urban areas, and inland rural areas. In Kenya the cities that contributed the most plastic leakage were Mombasa, Nairobi, Kisumu and Nakuru. In Mozambique, leakage was mostly from Maputo, Matola, Beira and Nampula. In South Africa, the cities of Johannesburg, Cape Town, Durban, Pretoria, and Soweto contributed the most plastic leakage. In Tanzania, it was found that the highest areas were all centred around Dar es Salaam: Kinondoni, Temeke and Ilala.

In the Mediterranean, leakage for Menorca was split to show the difference between leakage of macro-plastics by the tourist population (15 t per year) versus the resident population (53 t per year).

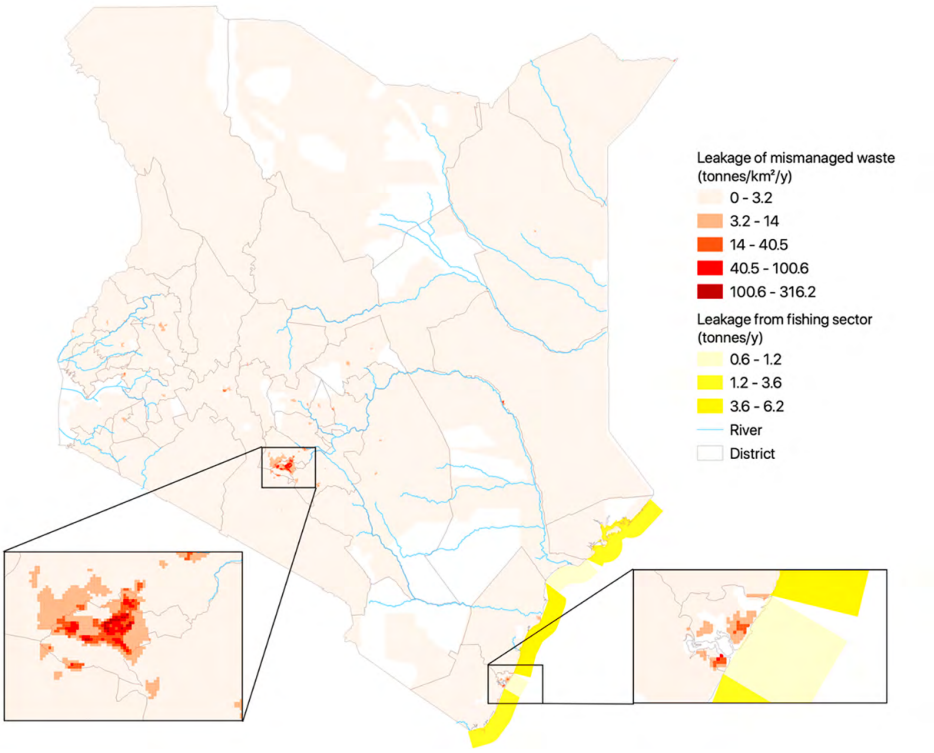
In Southeast Asia, populated areas are usually located close to a waterway or the coast. This increases the possibility of plastic leakage to the marine environment.

The importance of these mapped hotspots is twofold. Primarily, the maps identify where plastic is leaking, be it urban or rural; and they can also be used to supplement policy-making decisions related to other areas of interest, such as biodiversity conservation. If an area is a known hotspot, and if it overlaps with rivers transporting plastics to protected areas or coastal locations with known vulnerable species, then planning for the elimination of plastic pollution in those areas should be considered a priority.

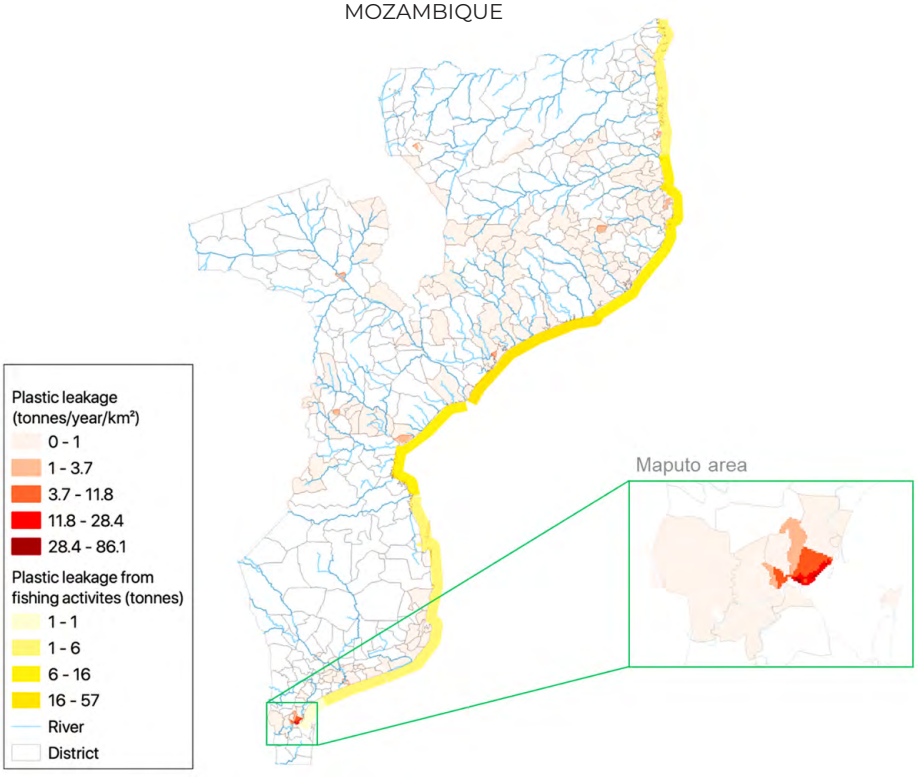
Across all three regions, fishing gear lost at sea or thrown overboard contributed to plastic leakage at various levels, from an annual leakage amount of 14 t in Kenya; to a fishing-gear-related leakage hotspot located on the west coast of South Africa (234 t/year), which hosts 54% of the ports identified in the analysis; to annual leakage from fishing gear lost at sea or as mismanaged waste and from overboard littering is 93 t in Cyprus, 225 t in Thailand, and 1,423 t in Viet Nam.

Figure 6 and Table 6 show the commonalities and differences between the geographic hotspots of the eight countries at a summary level. Please refer to the detailed pilot reports for more information.

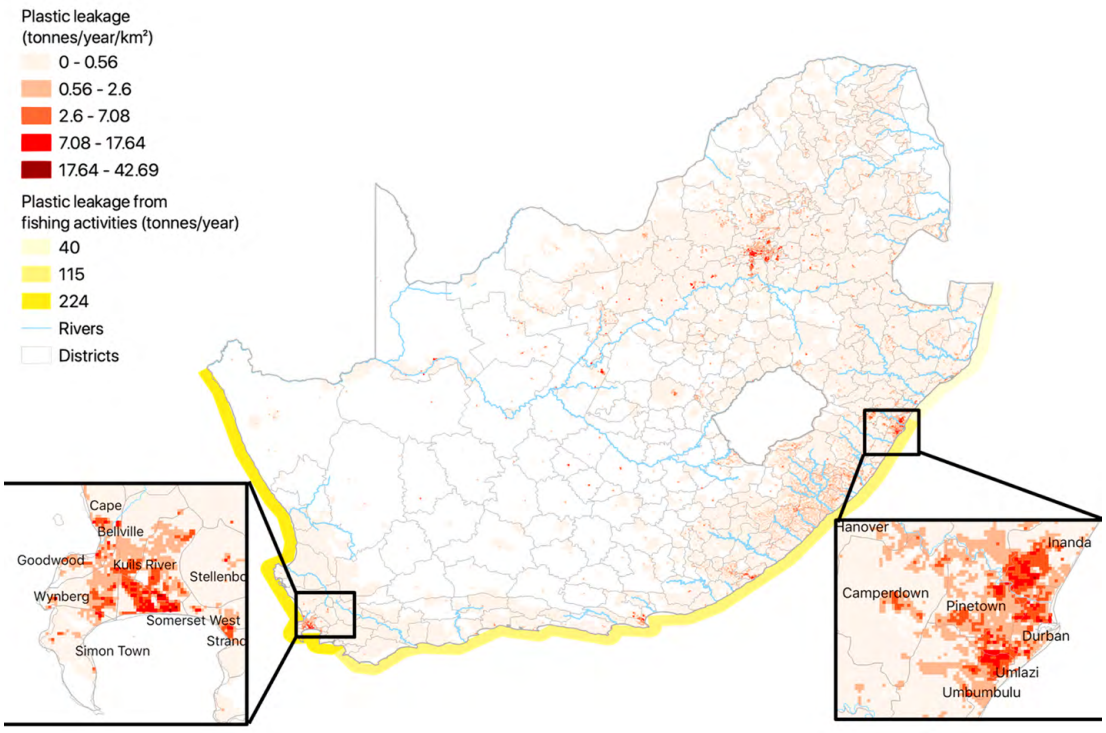
KENYA



MOZAMBIQUE




SOUTH AFRICA



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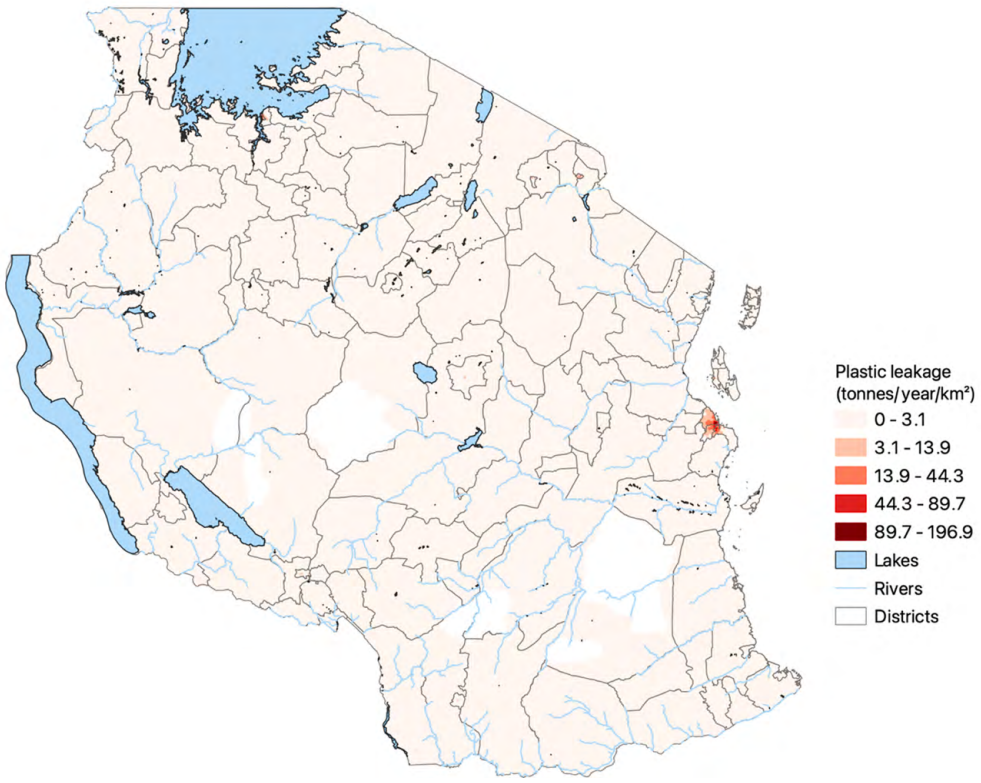
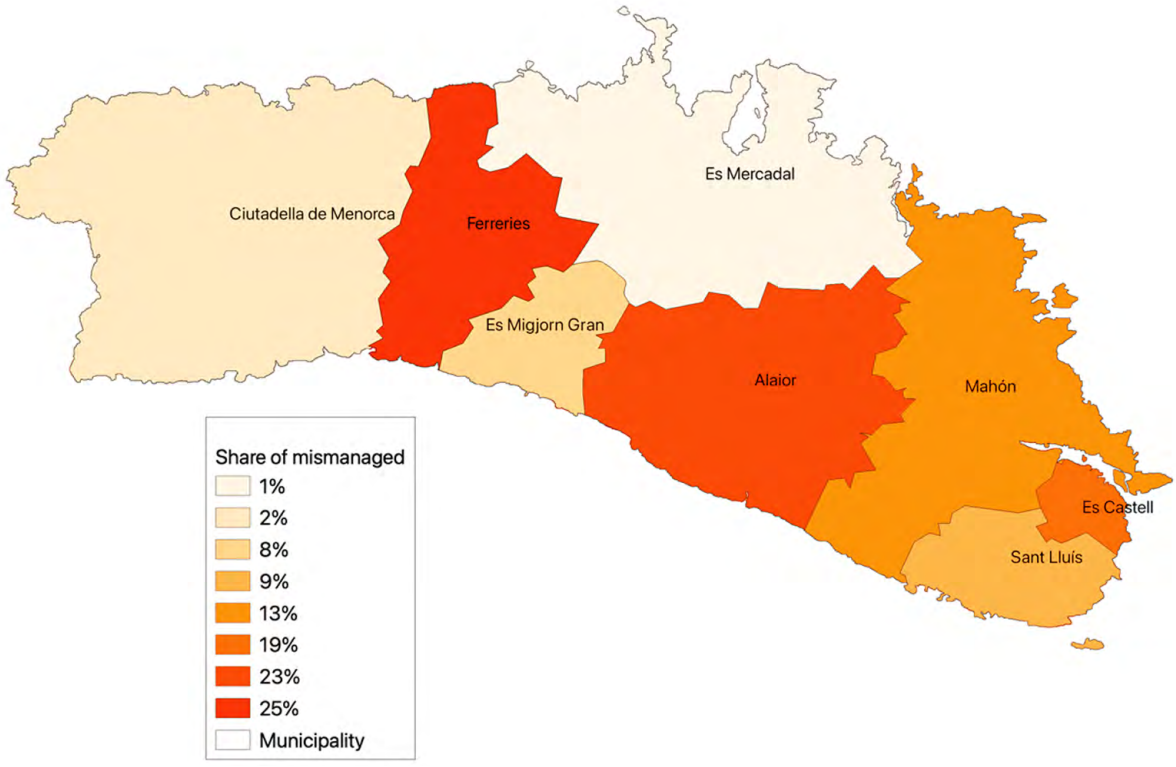



MENORCA



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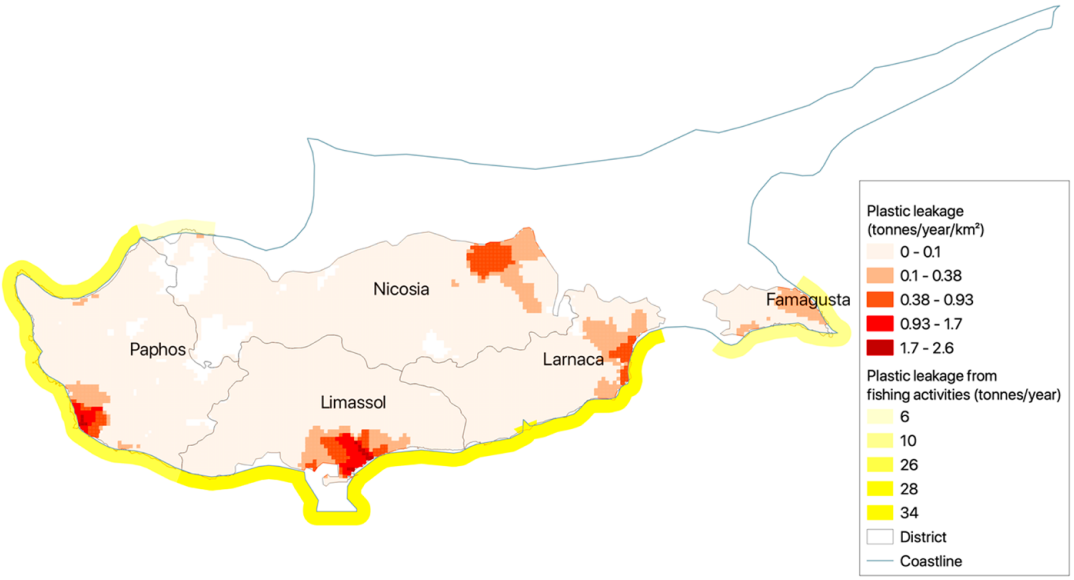
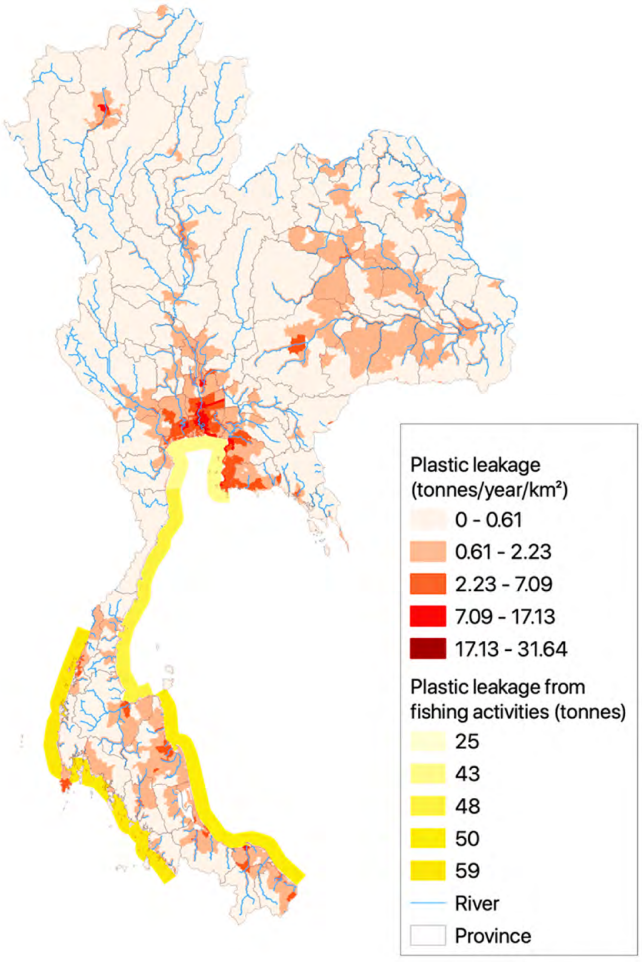



THAILAND



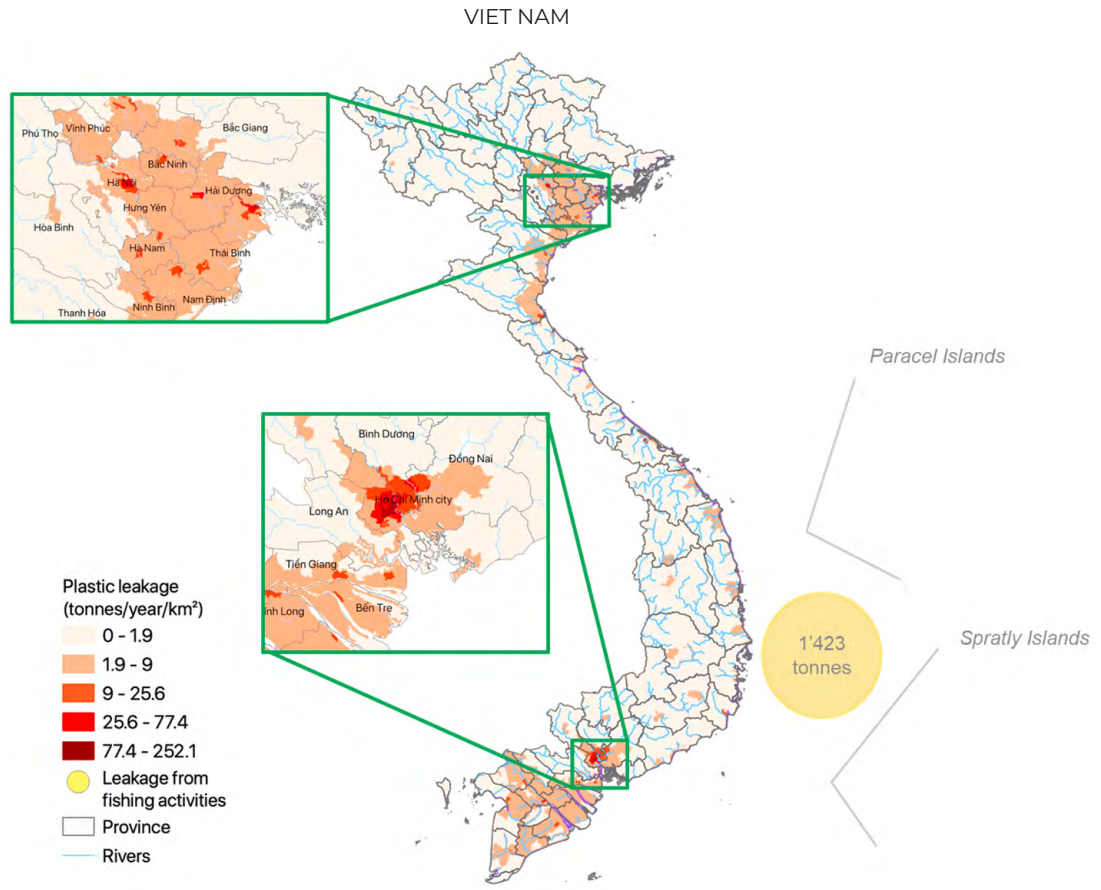



**Figure 6.** Geographic hotspots in each of the eight pilot locations, demonstrating that urban areas contribute a significant amount of plastic pollution, and that rural areas near rivers do so as well. In the Eastern and Southern Africa region, most plastic leakage was found to occur inland, in the main cities, other inland urban areas, and inland rural areas. In the Mediterranean, Menorca's maps show the differences between leakage caused by tourists (15 t) vs. residents (53 t). In the Republic of Cyprus, hotspots are located around cities of Nicosia, Limassol, Paphos and Larnaca. In Southeast Asia, populated areas are usually located close to a waterway or the coast. This increases the possibility of plastic leakage to the marine environment. Sources: National guidance for plastic pollution hotspotting and shaping action, pilot reports. *(IUCN et al., 2020)*

**Table 6.** Selected geographic hotspots and key takeaways for the eight pilot locations.

| | | Geographic hotspots | Key takeaways |
|---|---|---|---|
| **Mediterranean** | **Kenya** | Geographic hotspots related to waste generation and waste collection in Kenya showed that waste generation patterns vary sharply between urban (30 kg/capita/year) and rural areas (4 kg/capita/year). The annual leakage of mismanaged waste is 35,139 t. Annual leakage from fishing gear lost at sea or as mismanaged waste and from overboard littering is 14 t. | There is high per capita waste generation in urban areas compared to rural areas, and 67% of the plastic leakage comes from urban areas. The lack of sanitary landfills and incineration facilities means all of the plastic that is not recycled is mismanaged. There are no waste collection services in rural areas. Waste collection in urban areas varies from 20% to 72%. The average collection rate in the country is 27%. |

| | | | |
|---|---|---|---|
| | Mozambique | Annual leakage of mismanaged waste is 16,347 t. Annual leakage from fishing gear lost at sea or as mismanaged waste and from overboard littering is 141 t. Plastic leakage from the fishing sector is much smaller than plastic leakage from mismanaged waste. | The country's plastic leakage could be reduced by a third if all collected waste were properly disposed of in sanitary landfills or incineration facilities. The districts with the highest plastic leakage potential are Maputo, Nampula and Dondo, as the waste is not collected and urban areas with high populations contribute to leakage. Just seven districts out of 128 contribute to 50% of the total plastic leakage. The average release rate in Mozambique is 9.6%, meaning that 9.6% of mismanaged waste leaks into waterways. |
| | South Africa | Annual leakage of mismanaged waste is 100,555 t. Annual leakage from fishing gear lost at sea or as mismanaged waste and from overboard littering is 379 t. There is a leakage hotspot related to fishing gear and overboard littering located on the west coast (234 t/year), which hosts 54% of the ports identified in the analysis. | With the exception of Gauteng, populated areas are usually located close to a waterway or the coast. This increases the possibility of transfer of plastic waste to the marine environment. |
| | United Republic of Tanzania | Annual leakage from mismanaged waste is 26,785 t. Annual leakage from fishing gear lost at sea or as mismanaged waste and from overboard littering is 69 t. | Seventy-one percent of plastic leakage occurs in districts of Dar es Salaam, namely Kinondoni, Ilala and Temeke. |
| Mediterranean | Menorca, Spain | Of the island's total macro-leakage from mismanaged plastic waste, 53% is due to the resident population of Menorca. For residents, the average contribution to plastic leakage is 0.6 kg/capita/year. Only 6% of the total leakage comes from rural areas. | Residents contribute 78% of the total of plastic waste generated in Menorca, while tourists account for the remaining 22%. Note that 26% of the waste generated by tourists is generated on beaches. |
| | Republic of Cyprus | Annual leakage of mismanaged waste is 466 t. Annual leakage from fishing gear lost at sea or as mismanaged waste and from overboard littering is 93 t. | Leakage hotspots are located around the cities of Nicosia, Limassol, Paphos and Larnaca. However, leakage density (per $km^2$) is greatest in the cities of Limassol and Paphos and their surroundings. |
| Southeast Asia | Thailand | Annual leakage of mismanaged waste is 321,853 t. Annual leakage from fishing gear lost at sea or as mismanaged waste and from overboard littering is 225 t. | Several parameters drive the leakage across Thailand. Populated areas with high waste generation are usually located close to a waterway or the coast. From any place in Thailand, it is possible to find a river or a coast within a 70 km radius. This increases the possibility of waste transfer to the marine environment. Large quantities of waste are mismanaged due to low collection and/or disposal of waste at unsanitary landfills and dumpsites. High surface water runoff, especially in late summer/early autumn, drives leakage. In Thailand, 96% of the country is classified as having either "high" or "average" runoff. |
| | Viet Nam | Annual leakage from mismanaged waste is 443,531 t. Annual leakage from fishing gear lost at sea or as mismanaged waste and from overboard litter is 1,423 t. | Several parameters drive the leakage across Viet Nam. Populated areas are usually located close to a waterway or the coast (at an average distance of 6 km). This will increase the possibility of transfer to the marine environment. Surface water runoff peaks at a maximum of 16 mm per day in localised watersheds in November. |

*Source: National guidance for plastic pollution hotspotting and shaping action, pilot reports. (IUCN et al., 2020)*

## 2.8. Waste management hotspot summary

Waste management hotspots varied between the pilot locations. Figure 7 provides an at-a-glance overview of the hotspots while Table 7 provides key takeaways.

The charts in Figure 7 show whether different areas of waste collection and management streams have a positive (green), neutral (white) or negative (pink) contribution with regard to plastic pollution in a given country. Grey indicates that an area was not assessed.

In summary, starting with the countries in Africa, the three positively contributing areas related to waste generation in Kenya – plastic waste import, per capita generation, and share of plastic in the waste stream – support the finding that waste generation there is low compared to the global average. Waste segregation was found to be performed by the informal sector in all countries except Mozambique. Waste collection in the United Republic of Tanzania shows a positive contribution for recycled plastics, in contrast with negative contributions for the other three countries. Under waste management infrastructure for South Africa, there are neutral contributions for the share of plastic waste in dumpsites and in unsanitary landfills, with informal recycling and recycling capacity as positive contributions. Also, in South Africa, there are positive contributions for wastewater collection and treatment.

In the Mediterranean, both the Republic of Cyprus and Menorca have rather efficient waste management systems and together contribute less than 1% of the total leakage arising from all the nations bordering the Mediterranean Sea (0.1% for the Republic of Cyprus and 0.01% for Menorca). The Republic of Cyprus has four areas making positive contributions to waste management: low plastic waste import, low share of plastic waste in sanitary landfills, and good treatment and collection of wastewater. However, its waste collection rate (93%) is below the average for high income countries (96%). There is a lack of adequately designed bins and they are not emptied on a regular basis. In 2018, the Republic of Cyprus had no recycling capacity on its territory. The study also found significant export of plastic waste (around 9% of the total) to countries with lower waste management standards (for instance, Indonesia and India). For Menorca, positive aspects include well-functioning infrastructure, sufficient cleaning frequency, and efficient wastewater management. However, the design of waste bins fails to prevent leakage while waiting for collection: if bins are overfilled, wind and rain drive the release of waste into different compartments of the environment. Menorca also sees a significant amount of littering during the tourist season.

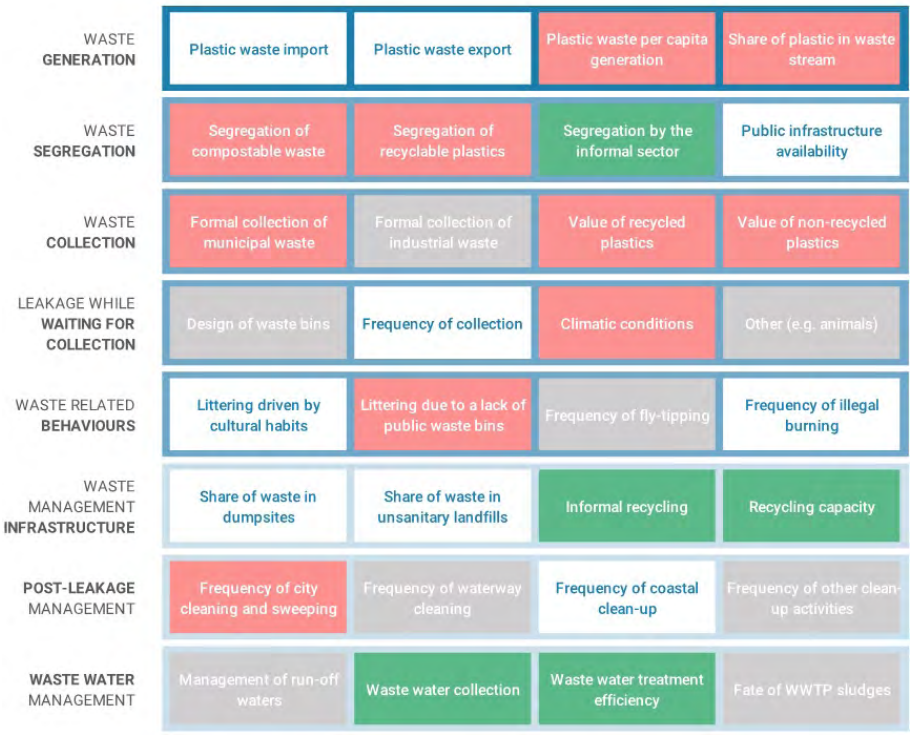
In Southeast Asia, the trends were different in that both Thailand and Viet Nam have strong post-leakage management of plastic waste related to waterway, coastal and other clean-up activities. Import of plastic waste is jeopardising the recycling infrastructure in both Thailand and Viet Nam, however. Collection of valuable plastics is significant in urban areas in both countries, but the collection of non-valuable plastics is lacking in Viet Nam. Open burning is a dominant practice in both countries.

In order to mitigate plastic pollution, all countries should aim to increase the number of areas making positive contributions to waste management by implementing interventions shared in Chapter 4.

KENYA


MOZAMBIQUE

SOUTH AFRICA

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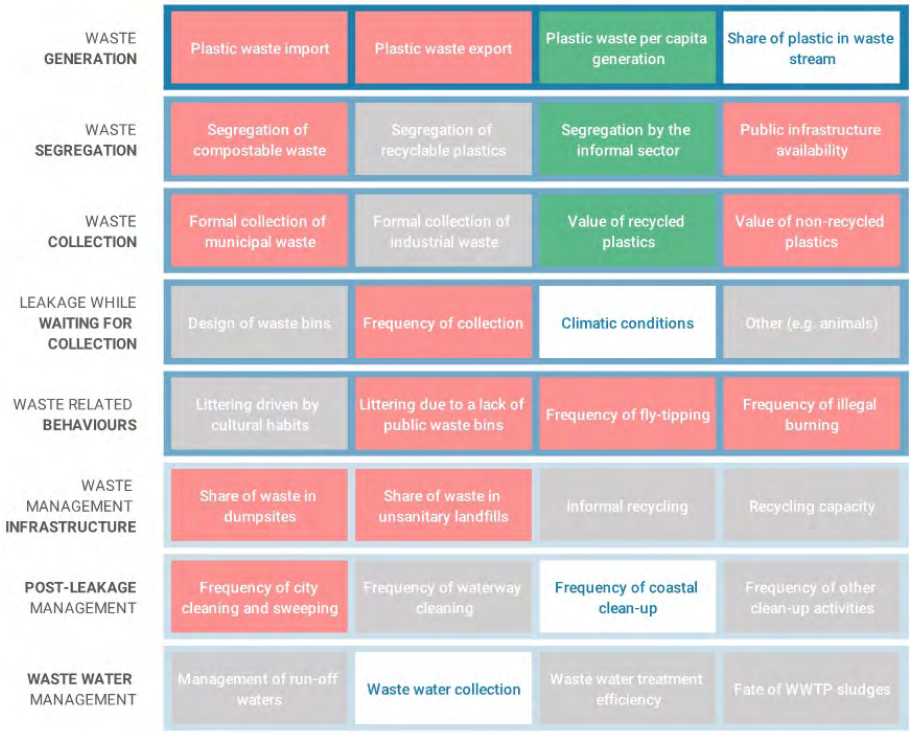

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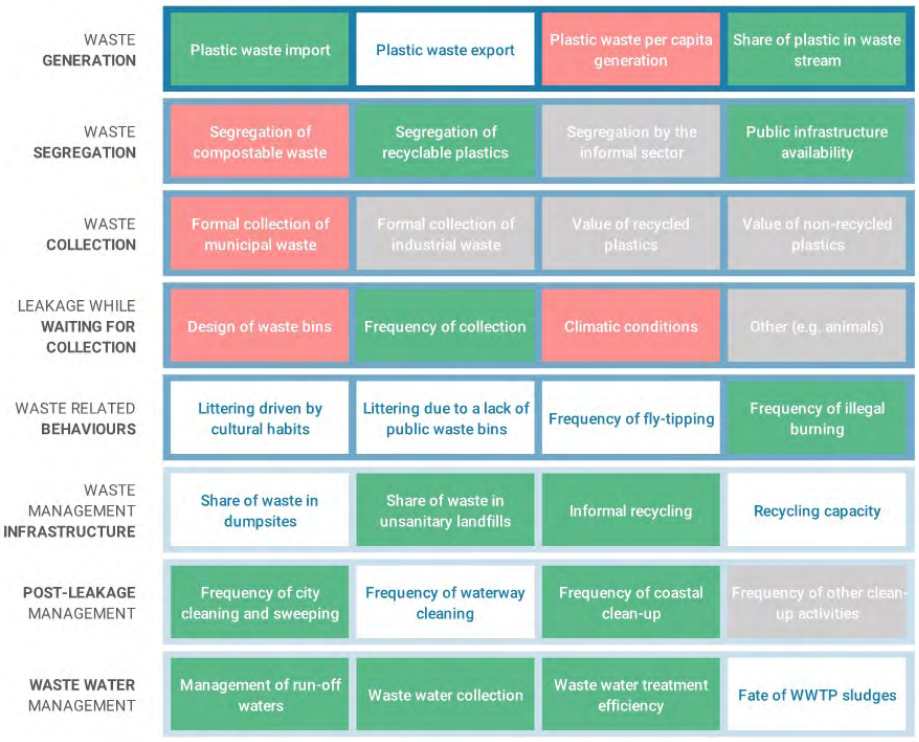


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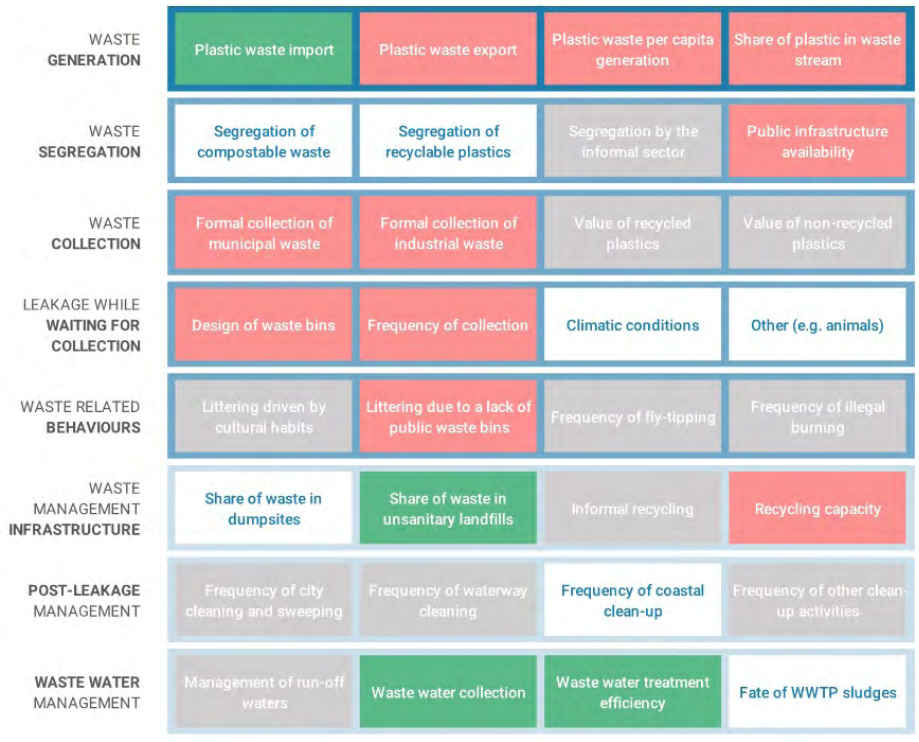

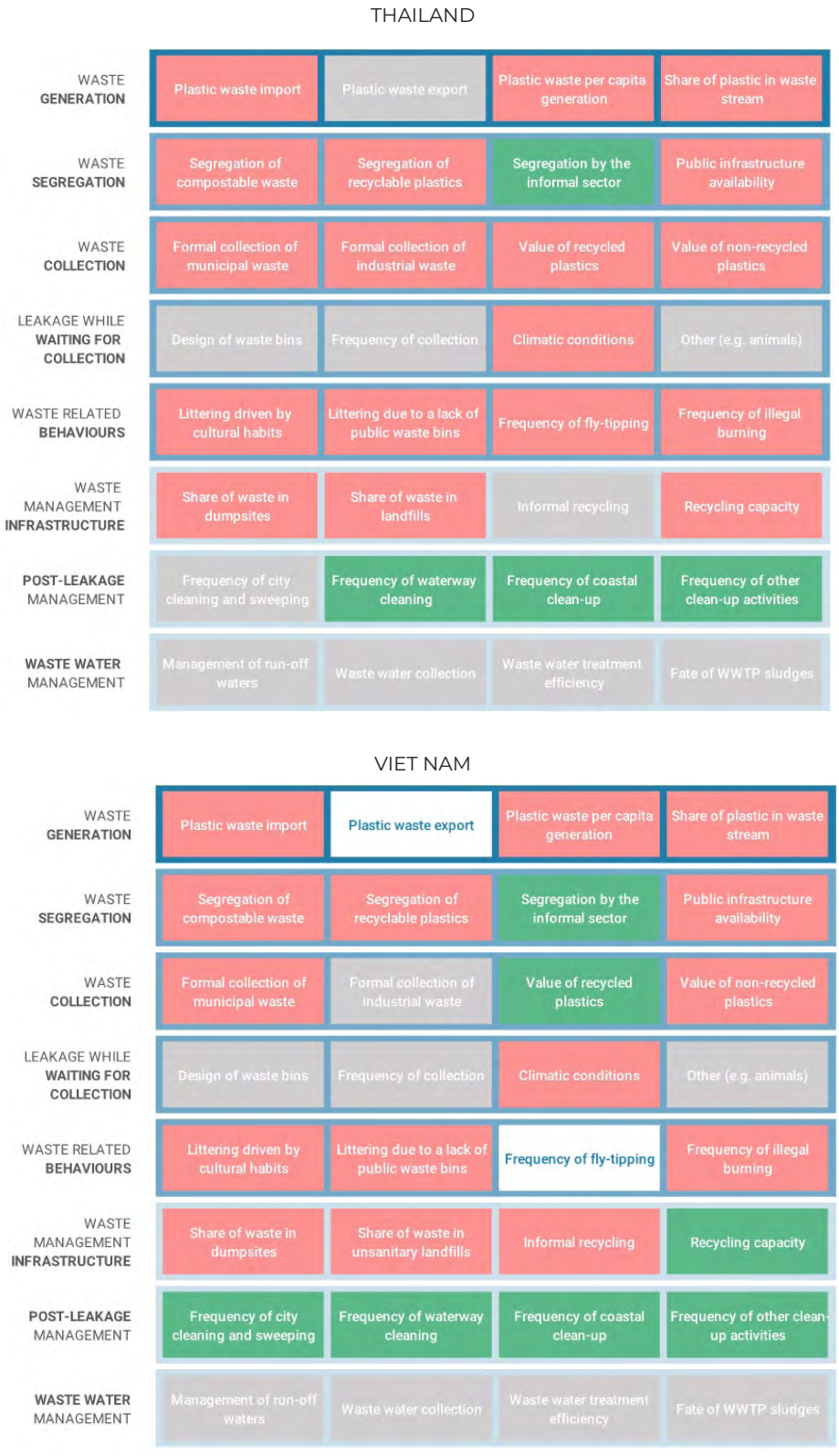


**Figure 7.** Waste management hotspots summarised by type across each of the eight pilots. The different areas of waste collection and management streams have a positive (green), neutral (white) or negative (pink) contribution with regard to plastic pollution in a given country. Grey indicates that an area was not assessed. Source: National Guidance for plastic pollution hotspotting and shaping action, pilot reports *(IUCN et al., 2020).*

**Table 7.** Waste management key takeaways for all pilot locations.

| Location | Key Takeaways |
|---|---|
| Kenya | • Waste management practices across Kenya were found to have both positive and negative contributions to plastic leakage.<br>• Plastic waste generation in Kenya is low compared to the world average.<br>• Segregation of waste is performed solely by the informal sector.<br>• There is no segregation of waste at source.<br>• The value of recyclable plastic is low, curbing the country's recycling rate.<br>• EPR schemes to subsidise plastic recycling are being discussed but have not been implemented.<br>• Collection rates are low, especially in rural areas and informal settlements.<br>• Littering and burning of waste are common habits even in city centres.<br>• Due to the absence of sanitary landfills and incinerators, there is no proper disposal of waste in Kenya. |
| Mozambique | • Plastic waste per capita is low but the share of plastic in the waste stream is high for a low-income country.<br>• Lack of waste segregation at source hinders recycling potential.<br>• The value of plastic waste is too low to incentivise informal collection.<br>• Areas prone to flooding are likely to contribute more to leakage.<br>• The lack of waste collection services and an absence of waste bins in peri-urban areas drive littering and burning behaviours.<br>• There are no sanitary landfills nor incineration facilities, leading to mismanagement of collected waste.<br>• There is a lack of recycling capacity and also a lack of wastewater treatment. |
| South Africa | • The share of plastic in the waste stream is high (18%).<br>• Waste separation at household level is low in many provinces.<br>• Slow economic growth and the state of the international secondary market drive recyclable plastic prices down, while plastics are still flooding the South African market.<br>• A lack of public waste bins, especially in low-income areas (including informal settlements) drives littering behaviours.<br>• Extreme meteorological events are common in South Africa and drive plastic leakage.<br>• Some municipal sweeping teams push waste into drainage systems and waterways for the sake of convenience. This increases leakage and can lead to clogging and floods during extreme rain events. |
| United Republic of Tanzania | • Plastic waste generation per capita (6 kg/capita/year) is below the average in Africa (14 kg/capita/year).<br>• The waste collection rate (40%) is below the average in low-middle-income countries (48%).<br>• The value of recyclable plastics for informal-sector workers seems higher than in some other African countries.<br>• Due to the absence of sanitary landfills and incinerators, there is no proper disposal of waste in the United Republic of Tanzania.<br>• Burning of waste is a widespread practice. |
| Menorca, Spain | • Plastic waste generation per capita (111 kg) is well above the Western Europe average (64 kg) per year.<br>• In 2018, compostable waste is still not segregated at source.<br>• The waste collection rate (90%) is below the average for high-income countries (96%).<br>• The design of waste bins does not prevent leakage while waiting for collection.<br>• Wind and rain are driving the release of littered waste within different compartments of the environment.<br>• Littering is driven by tourism, particularly in the high season.<br>• Positive aspects include well-functioning infrastructure, sufficient cleaning frequency and efficient wastewater management. |
| Republic of Cyprus | • Plastic waste generation per capita (94 kg/capita/year) is above the Western Europe average (64 kg/capita/year) and the share of plastic in the waste stream is high (16%).<br>• The waste collection rate (93%) is below the average in high-income countries (96%).<br>• There is a lack of adequately designed bins and bins are not emptied on a regular basis.<br>• In 2018, the Republic of Cyprus had no recycling capacity on its territory.<br>• There is a significant export of plastic waste (around 9% of the total) to countries with lower waste management standards (for instance, Indonesia and India).<br>• Some positive aspects are the absence of unsanitary landfills, good wastewater collection and treatment, and low volumes of plastic waste import. |

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| **Thailand** | • More plastic waste was imported in 2018 than could be recycled in the country.<br>• Per capita plastic waste generation in Thailand (66 kg/capita/year) is above the world average (29 kg/capita/year).<br>• Plastic accounts for 20 to 30% of all waste generated.<br>• The informal sector plays a key role in collecting and segregating plastic for recycling.<br>• Sanitary landfill and incinerator capacity covers only a third of the country's waste generation.<br>• Open burning is a rampant practice in rural areas.<br>• Flooding events are recurrent in Thailand and this induces significant leakage. |
| **Viet Nam** | • Import of plastic waste is jeopardising the recycling infrastructure.<br>• Per capita plastic waste generation in Viet Nam (58 kg/capita/year) is above the world average (29 kg/capita/year).<br>• Collection of valuable plastics is significant in urban areas.<br>• Collection of non-valuable plastics is lacking.<br>• Informally recycled plastics are mismanaged and lead to leakage.<br>• There is a lack of sanitary landfills.<br>• Open burning is a dominant practice in rural areas.<br>• Flooding is recurrent in Viet Nam and induces significant leakage. |

*Source: National guidance for plastic pollution hotspotting and shaping action, pilot reports. (IUCN et al., 2020)*

# 3. Policy, economics, and circular economy

**This chapter covers** summaries of the policy and economic research and the circular economy innovations to set the scene for the recommendations in the next chapter. For detailed methods used, please refer to Annex 2.

The main sources for the material in this chapter are from the contributing authors of the national reports from IUCN for each of the seven countries: *The legal, policy and institutional frameworks governing marine plastics* (2020) series and *Policy effectiveness assessment of selected tools for addressing marine plastic pollution Regulations on plastic products and Extended Producer Responsibility* series (2020), and from three *Economic Briefs* (IUCN, 2021) whose contributing authors are noted below.

## 3.1. Key findings of the policy assessments

If regulatory and legislative frameworks are in place to mitigate and manage plastic waste and pollution, they form the basis for sound management at local and national levels. States around the globe have enacted regulations to address plastic pollution by targeting the different stages of the plastic life cycle: production, trade, transport, retail, consumer use and end-of-life. However, while many local, national, and regional actors have identified and begun to implement the easiest solutions to the plastic pollution crisis, such as laws that ban single-use plastics, there is a need to integrate a life-cycle approach into more effective, complete solutions and policies. These solutions need more in-depth measurement and evaluation to identify the root problems, and what regulatory and legislative tools would be most effective to stop plastic leakage.

The policy-scoping studies for plastic pollution analysed the legal, institutional and policy frameworks governing marine plastics in seven of the eight locations. A common theme identified across the three regions is that a lack of cohesive policy frameworks and of enforcement, along with systemic weaknesses, creates barriers to the mitigation of marine and coastal plastic pollution. These barriers can also be seen as opportunities for action, as discussed in the chapter on recommendations for action. A summary of the key policy findings for seven of the eight pilots is shared in Table 8. (A policy assessment was not undertaken in the United Republic of Tanzania.)

**Table 8.** Key findings of the plastic pollution policy assessments in seven locations including relevent polymers, life-cycle stage of the plastic, and regulations associated with each.

| Location | Key policy findings | Polymers and application noted | Plastic life-cycle stage and regulations |
|---|---|---|---|
| **Kenya** | Efforts made by the government, which include recent bans on the use, manufacture and import of plastic carrier bags and flat bags, have achieved some notable success. However, the Government Notice lacks clarity on the scope of the ban. Although there is no extended producer responsibility (EPR) framework in place, there is a voluntary effort from the industry sector to establish take-back mechanisms. (Opondo, 2020a)<br>For many years Kenya has struggled to find the appropriate legal and policy framework to deal effectively with plastic waste. New efforts by the national government to strengthen the regulatory framework for solid waste management now include plastic waste, and the government is undertaking various policy and legislative reforms to strengthen solid waste management practices. (Opondo, 2020b) | PET<br>Plastic bags | There are regulations for the management of all forms of solid waste in Kenya, including plastic waste. The regulations cover all stages of the waste life cycle. End-of-life is the most regulated segment of the plastics life cycle in Kenya as, at this point, plastics are essentially waste. This tight regulation is intended to ensure that waste transporters and waste disposal facilities operate in an environmentally friendly manner, and that all regulatory conditions imposed in that regard are monitored and complied with. PETCO is a voluntary industry-led self-regulation scheme. Kenya currently does not have any law on EPR that would compel producers to take back end-of-life products such as PET. |
| **Mozambique** | The production, import and retail sale of plastic bags with a thickness of less than 30 microns is prohibited. An environmental tax on packaging is also under development but has not yet been approved. In addition, there is no overarching policy to address plastic pollution that would permit the establishment of a clear roadmap or strategy. There is a lack of appropriate and harmonised legislation and institutional coordination. (Da Silva, 2020)<br>The design and implementation of Mozambique's EPR framework is crucial to its success and is an ongoing process. Many barriers must be considered during the design, and the participation and engagement of important stakeholders is necessary to draft an inclusive framework. EPR systems cannot be run by the private sector on its own, and there will be a need for the system to be complemented by a wider set of institutional regulations, industry action, and consistent innovation in packaging design. (Reclay-StewartEdge, 2021) | Single-use plastics<br><br>Plastic bags<br><br>Plastic bottles | Mozambique does not have a national waste management policy that broadly addresses the various issues related to the management of plastic waste. However, the establishment in 1994 of the Ministry for the Coordination of Environmental Action (MICOA), with powers to develop policies and legislation to deal with pollution, indicates a recognition that pollution control is one of the major environmental challenges in Mozambique. |

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| **South Africa** | Plastic bags below 24 microns are prohibited and a plastic bag levy has been established. However, both of these measures have proven to be relatively ineffective and are being reviewed. The existing legal framework focuses on the production and post-consumer stages of the plastic life cycle through an elaborated EPR mechanism.<br>There are highlighted legal issues at instrumental, institutional, and behavioural levels. The report examines the role of the informal sector around EPR, with a focus on the Waste Act, and specific provisions and regulations developed by the government. Waste-picker integration is important for industry and EPR plans in South Africa; the design and implementation of EPR schemes must be participatory and negotiated. A set of recommendations is provided to move forward on the new EPR frameworks in South Africa. In this instance, the Minister of Environment, Forestry and Fisheries can require an industry to develop an Industry Waste Management Plan. Alternatively, the Minister can impose specific EPR measures on industry, which may include both upstream and downstream measures. (Rumble, 2020) | PET<br>Plastic bags | South Africa's Waste Act applies to plastics throughout their life cycle, including as products (for example in relation to product design or the banning or control of certain products) as well as in waste form (for example through Industry Waste Management Plans and EPR requirements). The Waste Act also provides for layered planning instruments for waste management across government. |
| **Menorca, Spain** | A recent waste law introduced in 2021 included a priority need to promote measures for pollution prevention in the production phase of packaging waste. It also set new recycling targets for 2025 and 2030, according to the new calculation method established in the European Commission's Implementing Decision (EU) 2019/665, which modifies Decision 2005/270/EC, and the EPR regime, according to the new community guidelines; affected producers assume the real and total cost of the management of packaging waste. The application of the EPR system is for all packaging and packaging waste. (Iovinelli, 2021) | PET<br>HDPE<br>Plastic bags | Regulations concern all stages from production to end-of-life. There are several pieces of legislation and policies related to plastic production, recycling, collection, management, and end-of-life management at a national level in Spain. |

| | | | |
|---|---|---|---|
| **Republic of Cyprus** | While there are many policy gaps and challenges, including on implementation, EPR is regulated for the waste streams of packaging, electrical and electronic equipment, batteries and accumulators, and tyres. The national plan foresees the adoption of legislation expanding EPR to other materials such as non-packaging paper, plastics, and metal. (Iovinelli, 2021) | LDPE<br>PET<br>PP<br>Synthetic rubber<br>Single-use plastic products<br>Plastic bags<br>Plastic bottles | The 2015 municipal solid waste management plan prioritises separated collection and introduces economic deterrents, such as a landfill tax, the extension of EPR to plastics, and pay-as-you-throw (PAYT). However, schemes such as PAYT, banning of single-use plastics and deposit return schemes (DRS) will not be implemented until the end of 2021. The Republic of Cyprus still faces problems in implementing the relevant EU waste policy. This is mainly due to the lack of infrastructure and systems for collecting recyclables, the lack of coordination between different administrative levels, and the lack of capacity at local level. With the implementation of the plastic bag tax, recycling schemes and some pilot programmes focusing on PAYT, local authorities are taking steps towards managing plastic waste, but it is not enough to effectively address the plastic pollution issue. |
| **Thailand** | The government recently acted to address the issue of plastic pollution, with the creation of a sub-committee on plastic waste management, focusing on different leverage points from awareness-raising to waste management mechanisms. However, it is hampered by an overall lack of coordination and a fragmented legal framework. There are highlights of legal issues at instrumental, institutional, and behavioural levels and the report examines the role of the informal sector around EPR, bans or limitations on single-use plastics and plastic bags, limitations on international imports of plastic scraps, and coordination and sharing of information. (Popattanachai, 2020a; Popattanachai, 2020b) | PET<br>HDPE<br>Single-use plastic products | Thailand's scope of environmental legislation and regulations does not address the entire life cycle of plastics but gives priority to waste management and disposal. The fact that there is no single piece of legislation designed to deal with plastics complicates the handling of marine plastic pollution. Instead, Thai waste management law is fragmented, involving several pieces of legislation, government departments and agencies. In terms of policy framework, Thai policies relating to marine plastic pollution need to be considered from both environmental and energy perspectives. |
| **Viet Nam** | Import of plastic waste is a major issue that has not been adequately addressed by the government. The informal sector plays a crucial role in the treatment of plastic waste, by creating a waste segregation system, but it is not recognised by the administration. Several initiatives aim at developing a legal framework on EPR in the country and newly published regulations will take effect in January 2022. (Phuong, 2021a; Phuong, 2021b) | | Viet Nam does not give any special consideration to plastics by law, except for certain regulations on plastic bags. Plastics are not addressed through a life-cycle approach in the legal framework, as it mostly focuses on production, importation of scrap for production, and waste management. |

*Source: IUCN Environmental Law Centre, 2020.*

Following consultation with key institutional, industry, and civil-society stakeholders to prioritise legal and policy tools for addressing plastic pollution, at least one legal tool was identified in each target country as the most appropriate to tackle marine plastic pollution. **In-depth assessments on EPR** analysed the current state and future scenarios, and contributed to measuring the impact of regulatory mechanisms, in place and in development, for tackling marine plastic pollution. These assessments focused on the topics shown in Table 9. An overview of economic frameworks or laws can facilitate the use of alternatives, promote a mindset change in producers, and trigger innovation.

## 3.2. Key findings of the economic briefs

The next sections provide summaries of ongoing economic research into the effects that plastic pollution has on different sectors. Throughout this publication, a comprehensive approach is emphasised, and assessing the impact on different sectors is one of the most important elements of this. To be able to deliver an overview of which economic sectors are impacted by plastic pollution, asking questions about the impact of plastic pollution on a particular sector – fisheries, or tourism, for example – and about the broader economic dimensions, relating to export revenue, employment, food security, and the health of marine ecosystems and biodiversity, is necessary.

The next sections provide summaries of research into the impacts of plastic pollution on fisheries, marine biodiversity, tourism, and waste management.

### 3.2.1. Fisheries

In 2021, IUCN published *Marine plastics, fisheries, and livelihoods in Mozambique*. This research demonstrated how fisheries suffer direct economic impact from marine plastic pollution. The economic losses for marine fisheries include aspects such as the value of dumped catch, the costs to repair fishing gear and nets, the overall costs of fouling incidents, and lost earnings as a result of reduced fishing time due to clearing litter from nets (Mouat, et al., 2010). A large proportion of the population relies on the fisheries sector for subsistence. It is estimated that this sector contributes 50% of the total animal protein consumed nationally (Souto, 2014). By directly impacting fishing and fish stocks, marine plastic pollution has a negative effect on the livelihoods and food security of the people of Mozambique.

The potential average annual cost of plastic pollution on marine fisheries in Mozambique is estimated at MZN 347 million (USD 5.4 million) or 0.05% of GDP, based on 2017 values. However, costs and revenue losses could potentially be higher due to an underestimation of the value of fisheries, but also due to aspects not included, such as the costs resulting from the impact of ghost fishing[4]. Table 10 shows the potential cost of marine plastics to national marine fisheries. Extrapolating these models to other coastal nations with similar plastic pollution hotspotting results would likely show similar detrimental effects and should be researched.

**Table 9.** Potential cost of marine plastics to Mozambican national marine fisheries.

| Impact estimate (%) | Source estimate | Impact revenue Mozambican marine fisheries (MZN/year) |
|---|---|---|
| 0.3 | Takehama (1990), McIlgorm et al. (2011, 2009) | 50,804,703 |
| 0.9 | Arcadis (2014) | 152,414,109 |
| 2.0 | UNEP (2014) | 338,698,020 |
| 5.0 | Mouat et al. (2010) | 846,745,050 |
| **Average** | | **347,165,471** |

*Source: Raes et al., 2021.*

4 Derelict fishing gear, sometimes referred to as "ghost gear," is any discarded, lost, or abandoned, fishing gear in the marine environment which continues to "fish" and trap animals, entangle and kill marine life, smother habitat, and act as a hazard to navigation.

Reducing plastic leakage to the environment can create positive outcomes that are beneficial not only for the environment, but for the fisheries sector, other sectors of the economy that depend on the marine environment, and the economy as a whole. There are a broad range of potential interventions and solutions for consideration, such as improved waste management infrastructure and the inclusion of coastal communities in circular economy initiatives. The improved management of plastic waste and the reduction of plastics flowing into the marine environment should be an integral part of any strategy that attempts to strengthen the economic sectors that depend on the marine environment, or when reviewing support to the blue economy of Mozambique or other countries.

### 3.2.2. Marine biodiversity

Marine plastic pollution leaked from terrestrial sources, plastic debris from fisheries and other marine activities, and plastics entering Mozambique's – or indeed, any nation's – waters negatively impact the country's fisheries sector and livelihoods, as well as marine ecosystems and biodiversity.

Solid plastic particles found in the ocean are ingested by marine fauna. Certain marine animal populations, especially those that feed exclusively at sea, such as seabirds and sea turtles, present plastic debris in their stomachs (Hammer et al., 2012). This can potentially have lethal consequences, especially as the amount of plastic ingested and stuck in the guts of animals increases. Discarded and semi-inflated floating bags are a particular hazard for sea turtles, as they are often mistaken for jellyfish, and can block the oesophagus once ingested (Gregory, 2009). Entanglement in plastic debris is another manner in which animals are impacted (Galgani et al., 2019). Marine mammals are among those species that are most affected by entanglement (Hammer et al., 2012). Abandoned, lost, or otherwise discarded fishing gear poses special risks for large, air-breathing marine animals, such as whales, dolphins, seals, sea lions, manatees, and dugongs, as they can become entangled in the nets and drown (Laist, 1997; Lusher et al., 2018). According to the Convention on Biological Diversity (CBD) report, *Marine Debris: Understanding, Preventing and Mitigating the Significant Adverse Impacts on Marine and Coastal Biodiversity* (CBD, 2016), the total number of species known to be affected globally by marine debris (mainly plastics) is around 800. These impacts can occur through different routes, primarily through ingestion, entanglement, and the toxic effects of chemical additives. For example, 40% and 44%, respectively, of cetacean and seabird species are affected by ingestion of marine debris (CBD, 2016).

Marine plastics can further affect marine biodiversity and ecosystems by facilitating the introduction of alien species. Free-floating marine plastics can disperse aggressive invasive species. The introduction of new species could endanger sensitive or at-risk coastal environments (Gregory, 2009).

The effects of plastic pollution on marine biodiversity show that consideration should be given to national use of the maps that result from the hotspotting assessments with maps from within the IUCN Red List of Threatened Species™ and the IUCN Green List of Protected and Conserved Areas, to examine vulnerable areas where national action plans to combat plastic pollution can have the greatest positive impact.

### 3.2.3. Tourism and clean beaches

Plastic debris is commonly found on many beaches (Hammer, 2012). The 2021 IUCN publication *Efficiency of beach clean-ups and deposit refund schemes (DRS) to avoid damages from plastic pollution on the tourism sector in Cape Town, South Africa* (Jain et al., 2021) synthesises a detailed analysis of the costs and benefits of current beach clean-ups in Cape Town and estimates of the cost efficiency of implementing a DRS in conjunction with beach clean-ups. Though it is a local, specific example, there are implications for coastal tourism globally.

The major economic cost of this plastic debris is the reduced aesthetic appeal of coastal areas. This adversely affects the tourism industry, leading to a loss of output, revenue, and employment (Jang et al., 2014). Adopting a DRS in combination with beach clean-up practices could reduce the cost of beach cleaning by an estimated 14%. The number of plastic bottles on beaches and the cost of a DRS will continue decreasing as bottle-return rates increase; in other words, the DRS will become more efficient. Jointly implementing the two interventions increases the overall cost efficiency of keeping the beaches clean.

**Table 10.** The cost to clean beaches is reduced with a deposit return scheme in place.

| Scenarios | Cost of cleaning beaches with DRS (ZAR) | Cost of beach clean-ups (ZAR) | Total cost to clean beaches with both interventions (ZAR) |
|---|---|---|---|
| Without DRS | | 13,029,387 | 13,029,387 |
| DRS 74% | 51,571 | 11,367,299 | 11,315,728 |
| DRS 87% | 54,439 | 11,054,352 | 10,999,913 |
| DRS 94% | 55,855 | 10,885,713 | 10,829,858 |
| DRS 100% | 57,141 | 10,741,238 | 10,684,097 |

*Source: Jain, et al., 2021*

In addition, the implementation of a DRS can contribute to the creation of jobs in retail, bottle collection and waste management, as well as administrative staff to ensure the smooth functioning and implementation of the DRS.

### 3.2.4. DRS as an instrument for a circular economy

The 2021 publication, *Economic Assessment of a Deposit Refund System (DRS), an Instrument for the Implementation of a Plastics Circular Economy in Menorca, Spain* (Sanabria Garcia and Raes, 2021) noted that a DRS was proposed for Spain where a deposit of EUR 0.2 was considered for the baseline DRS scenario (Fletcher et al., 2012). A cost-benefit analysis (CBA) with business-as-usual (BAU) scenarios was conducted with the aim to link a DRS to benefits of a plastic circular economy.

The results show the benefits of implementing a DRS compared to the current collection system. The analysis also addresses the main polymer and sector hotspots identified in the hotspotting analysis performed in 2020. The context of Menorca – including its status as a biosphere reserve, the dependence of its economy on tourism, the results of the current plastic waste management system, and the sustainability strategy adopted by the government – are reasons to continue adapting and proposing interventions. Circular-economy instruments for plastics can play an important role for Menorca, addressing impacts from the source, while supporting the transition towards sustainability (CIME, 2020c). A further point to note is that, as the purchase cost of beverages increases, the number of units purchased would be expected to decrease, and so there would be a decrease in the amount of bottle waste that is generated.

The CBA results showed that the DRS, considering a deposit of EUR 0.2, is feasible and could be economically self-sufficient. Despite the higher costs of the DRS scenario, it is profitable, contrary to the BAU scenario, which generates a cost for the island's government. However, by varying the deposit amount, it was found that the optimal deposit, at which the net benefit is at the maximum, is EUR 0.3. This also provides a higher return rate (94% instead of 91.5%). Nevertheless, the deposit of EUR 0.2 was used as the baseline DRS scenario for this study since it was proposed for the DRS in Spain and it is closer to the average deposit in European DRSs.

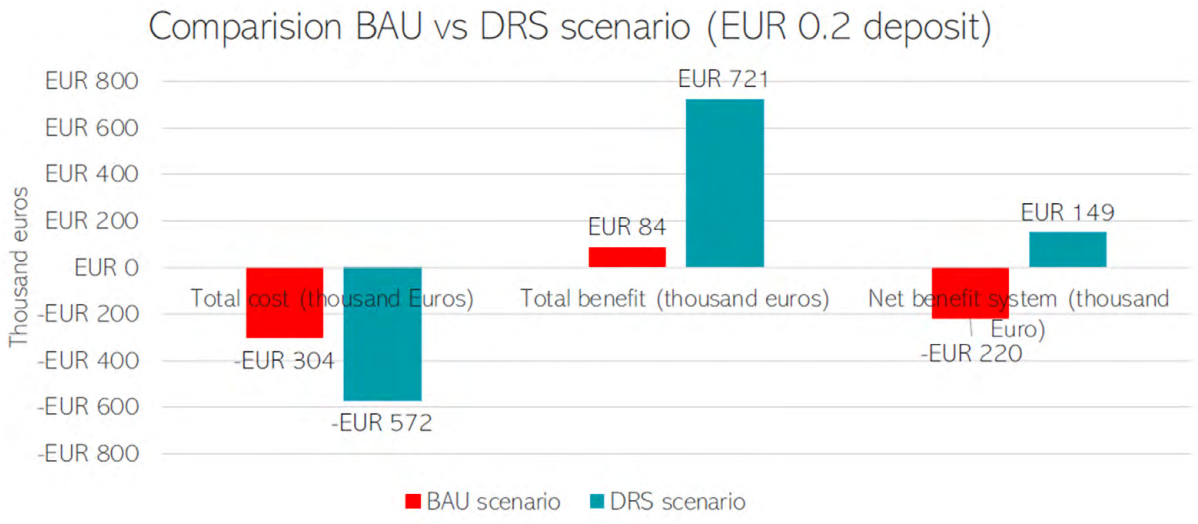


**Figure 8.** Comparison of cost, benefit, and net benefit of Business as Usual (BAU) and Deposit Return Scheme (DRS) scenarios (with a deposit of EUR 0.2 and return rate of 91.5%).
*Source: Sanabria Garcia and Raes, 2021.*

Since the most significant source of revenue for the DRS is unclaimed deposits, the system must be carefully designed and targets for collection should be put in place. Thus, the goal should be to reach a high return rate (aiming for the ideal 100%) and not the highest profit. If the system is designed to make a profit (by lowering the return rate), the flow of PET bottles under the BAU scenario will remain. Consequently, the linear economy model is maintained, at the expense of the main objectives of the policy, which are to expand the plastics circular economy, to increase collection and recycling, and to reduce plastic leakage.

## 3.3. Capacity in circular-economy innovations

The IUCN circular-economy initiatives support coastal communities by creating jobs and long-term economic opportunities. These innovative projects reduce pressure on coastal and marine resources, which are critical for the resilience of the local communities. By supporting existing, small-scale initiatives that aim to reduce the amount of plastic leaking into the marine environment, and building their capacity through educational components, IUCN is creating successful models of the plastics circular economy that can be easily replicated in other countries. The IUCN circular-economy projects validated the need to explore mechanisms to strengthen the capacities of local initiatives to be financially self-sustaining. The aim should be to unlock varied sources of capital and channel it to achieve impact at scale.

Currently, immense innovation is ongoing in Africa and Asia to utilise recovered plastic waste. Entrepreneurial communities across the regions are the enablers of the circular economy through their action to collect and recover plastic and other valuable waste. While a 'true' shift towards a vibrant circular economy will involve technology, infrastructure, policy, and process changes, the hundreds of thousands of community members who work in the informal sector are the front line in diverting plastic waste out of the environment.

**Table 11.** Capacity through circular economy: Innovative initiatives sponsored by IUCN.

| Country | Organisation | Project innovation |
|---|---|---|
| **Kenya** | EcoWorld Recycling, Kilifi County Circular Economy Enterprises, Watamu Marine Association | Created a dynamic plastic-waste value chain between the local community and the tourism industry. |
| **Mozambique** | 3R-Reduzir, Reusar e Reciclar Limitada, Parco | Transformed the recycling sector with a market-based solution that contributes to cleaning the environment and providing income to marginally employed or unemployed people. |
| **South Africa** | Wildlands Conservation Trust (WildTrust), WildOceans | At Durban Port, active clean-ups are undertaken by youth; and three waste-trapping interventions catch the waste so it can be collected easily from the water and, in the case of non-recyclable plastic, be used for paver blocks. |
| **United Republic of Tanzania** | Arena Recycling Industries | A social enterprise that collects plastic waste from beaches in Dar es Salaam and produces eco-bricks, paving blocks and tiles out of recycled plastic waste, for the construction of houses and buildings in rural areas. |
| **United Republic of Tanzania** | Eco Act | A social enterprise that created a plastic extrusion technology called “Waxy II” to recycle and transform post-consumer plastics, packaging materials and agricultural waste into durable plastic lumber. |
| **United Republic of Tanzania** | Plastic Recycling and Youth Empowerment Group – PREYO | Created a method to turn plastic waste into refillable block pavement (building materials), home decoration (flowers), and furniture. |
| **Thailand** | Jan and Oscar Foundation | Support of the Moken people in the development of a community enterprise around waste management, generating livelihoods. |
| **Viet Nam** | Evergreen Labs Advisory Company Limited | Through the ReForm Cham Island Landfill Project, this business is transitioning waste management on Cham Island (and Hoi An) from the current linear process into a circular waste model. |

*Source: IUCN, 2021.*

# 4. Recommendations for action

**This chapter covers** recommended actions based on limitations found; mitigation strategies; moving towards a plastic circular economy; stakeholder recommendations; and mainstreaming and harmonising methods to eliminate plastic pollution globally.

The main sources for the material in this chapter are *Plastic Pollution Hotspotting and Shaping Action: Regional Results from Eastern and Southern Africa, the Mediterranean, and Southeast Asia* (Pucino et al., 2020) and the *National Plastic Pollution Hotspotting Reports* (IUCN et al., 2020), and the contributing authors of three *Economic Briefs* (IUCN, 2021) as noted in the text.

## 4.1. Global efforts

Globally, policy makers and governments should make efforts to adhere to and strengthen existing international legislative frameworks that address marine plastic pollution. The most important are the 1972 Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter (the London Convention), the 1996 Protocol to the London Convention (the London Protocol), and the 1978 Protocol to the International Convention for the Prevention of Pollution from Ships (MARPOL). Additionally, WWF's Global Plastic Navigator shows that 160 countries have publicly called for or agreed to consider the option of a new global plastics agreement.

Regional and national governments should consider legislative frameworks for EPR where appropriate. In the case of plastic, there is a strong connection between the private sector (the main supplier of plastic to the market) and the public sector (generally responsible for the infrastructure to handle plastic waste) and as such, EPR schemes have emerged as a tool to better connect these two dimensions of the plastics value chain. The reality, however, is that many governments of developing nations are not likely to be able to implement EPR schemes effectively without careful assessment of the feasibility in their specific context; they will require additional support for implementation. Many challenges faced by developing nations compound the plastic pollution problem, reinforcing the need for holistic solutions that can be introduced along with the necessary support to ensure they do not fail.

Policy makers and national institutions should consider creating linkages to emerging initiatives that encourage a circular economy for plastic. The Ellen MacArthur Foundation's Plastics Pact Network brings together national and regional initiatives – plastics pacts – that emphasise how knowledge sharing among stakeholders and coordination of actions can be tailored for success. Already, one such pact (Smart Waste Portugal) is using the UNEP/IUCN National Guidance to identify plastic pollution hotspots. IUCN encourages the other pacts to do the same.

The creation of blueprints for policy makers to use is another area where IUCN is focusing new efforts to guide interventions, instruments, tools, and capacity-building courses in the fight against plastic pollution. New materials are available on IUCN's Marine and Polar website, with additional coursework coming in 2022.

Furthermore, governments, research institutions, industries and waste management entities need to work collaboratively to rethink product design, use/reuse, and disposal, and to reduce microplastic waste from pellets, synthetic textiles, and tyres. Consumers and society must shift to more sustainable consumption patterns. This will require solutions that go beyond waste collection, separation, and management and that consider the life cycle of plastic products.

More funding for research and innovation should be made available to provide policy makers, manufacturers and consumers with the evidence needed to implement technological, behavioural and policy solutions to address marine plastic pollution, to rethink the production and design of plastics, and to improve circularity in products. There is a need to reduce both the production and consumption of plastics and to support strong upstream interventions that stop plastic from leaking to the environment.

It is imperative that strategies aiming to conserve marine biodiversity consider the reduction of plastic leakage and the stock of plastics present in the marine environment among their threat-reduction objectives. The ecosystem degradation caused by plastic pollution in marine and coastal habitats will impact negatively on fish stocks that depend on these habitats as well as on marine wildlife in general. Marine biodiversity that is not directly targeted by fisheries – such as seabirds and marine mammals – is not only impacted through habitat degradation, but also suffers directly through debris entanglement and drowning from marine plastic pollution.

### 4.1.1. Actionable hotspots across the three regions

An important output of the hotspotting assessments is the generation of lists of actionable hotspots to address plastic pollution at one or multiple stages along the plastics value chain. The list of actionable hotspots calls for a well-balanced set of actions across the value chain, with an emphasis on the end-of-life stage. Table 12 provides some examples.

**Table 12.** A selection of actionable hotspots taken from the IUCN national plastic pollution hotspotting and shaping actin pilot reports.

| KENYA |
|---|
| Address the need for proper disposal of waste, creation of sanitary landfills or incineration facilities, and collected waste that is not recycled and accumulates in dumpsites or unsanitary landfills. |
| Innovate ways to reduce cities' consumption of plastics. |
| Create business models for private collection companies to incentivise disposal at landfills. |
| Increase the maintenance capacity for waste management equipment (e.g. waste trucks), to avoid the disruption of waste collection. |
| **MOZAMBIQUE** |
| Find innovative methods to address waste in coastal areas such as projects to prevent plastic from entering the ocean. |
| Perform street clean-ups regularly. |
| Establish sanitary landfills in Mozambique. |
| Increase recycling rates and recycling capacities for polymers, especially for PP and LDPE. |
| **SOUTH AFRICA** |
| Create methods to prevent use of, increase reuse of, or establish deposit schemes for single-use packaging. |
| Increase the demand for recycled material on the domestic market through incentives (market price) to the informal sector to increase collection. |
| Increase frequency of waste collection. |

| TANZANIA |
| --- |
| Enable proper disposal of waste in either sanitary landfills or incineration facilities and incentivise their use to reduce use of dumpsites. |
| Increase recycling rates and recycling capacities for polymers, especially PP, PET, and HDPE, and find alternatives to their use. |
| Innovate ideas to manage tyre abrasion from synthetic rubber, which contributes most of the micro-leakage. |
| Incentivise fishers that work in territorial waters to retain and/or find longlines, which have a high loss rate at sea. |
| MENORCA, SPAIN |
| Work with the tourism industry to combat the high use by tourists of single-use plastics; innovate methods for reduction. |
| The plastic leakage of the automotive-tyre and fishing sectors should be addressed by reducing tyre abrasion through innovative new methods, and incentivising fishers to retain and remove fishing gear from the ocean, such as through ocean-bound plastic certification. |
| Create adequately designed bins that cope with frequent rain and wind to avoid plastic leakage to the ocean. |
| Increase beach clean-ups and DRS schemes in combination to address plastic waste on beaches. |
| REPUBLIC OF CYPRUS |
| Increase the means for segregation at source and create incentives for recycling plastic. |
| Innovate ideas to manage tyre abrasion. |
| Work with the tourism industry to combat the high use by tourists of single-use plastics; innovate methods for reduction. |
| THAILAND |
| Increase the means for segregation at source and create incentives for recycling plastic. |
| Increase provision of bins and collection rates, especially during monsoon season. |
| Identify policies and regulations to address the import of waste that exceeds the country's recycling capacity. |
| Increase economic incentives for plastic waste collection and recycling to increase recycling rates. |
| VIET NAM |
| Identify policies and regulations for the plastic waste being imported for recycling, and how these regulations can stimulate local plastic waste being recycled. |
| Incentivise an approach to increase plastic waste collection through the existing well-implemented *dong nat* system (door-to-door collection). |
| Innovate methods to prevent plastic reaching the canals in densely populated areas. |

*Source: Modified from the national plastic pollution hotspotting pilot reports. (IUCN et al. 2020).*

### 4.1.2. Selected national and regional interventions

Interventions are tangible actions that can be taken to reduce plastic leakage or its impacts. These are actions that directly affect physical flows in the system (mainly related to material flows and/or infrastructure). As a consequence, the outcomes of interventions should be easily measurable. Across Eastern and Southern Africa, detailed lists of priority national interventions emerged from the national reports and several were developed for consideration by regional bodies.

Priority interventions fall across the categories of sustainable production, consumption and lifestyles, waste collection systems, waste infrastructure, and recycling. A summary is provided in Table 13.

**Table 13.** A summary of national and regional interventions to reduce plastic pollution.

| **National interventions** | |
|---|---|
| Sustainable production, consumption, and lifestyles | • Reduce littering in urban areas.<br>• Consider implementing deposit return schemes (DRS).<br>• Reduce demand for single-use plastics.<br>• Consider implementing EPR frameworks after a similar in-depth review of the existing policy frameworks in each country, similar to the work presented in the IUCN EPR in-depth reports (2021). |
| Waste collection systems and infrastructure | • Ensure plastic waste has enough value to cover the collection costs (for all polymers).<br>• Ensure recuperation of used fishing gear.<br>• Increase capacity for proper waste disposal (sanitary landfills if other upstream solutions cannot be applied).<br>• National and local leaders should implement clean-ups of areas impacted by plastic pollution, as part of waste collection practices.<br>• Reduce open burning of plastic waste. |
| Recycling | • Increase plastic recycling capacity. |
| Regional recommendations for Eastern and Southern Africa | |
| Sustainable production, consumption, and lifestyles | • Governments should implement measures that discourage the production and import of plastic objects for which there is no recycling solution within the national authority.<br>• Consider a product substitution strategy for these items and support innovation for the alternative solutions that can be produced nationally or regionally.<br>• Governments and the private sector should consider developing and supporting measures that increase the value of after-use plastics and encourage the redesign of products and materials for end-of-life value and circularity. |
| Waste collection systems and infrastructure | • Consider sustainable financing models to improve municipal waste collection.<br>• Facilitate the creation of tools, and build capacity and knowledge for municipalities and local governments to address plastic pollution in major cities, towns, and peri-urban areas.<br>• Scale up measures for plastic waste collection and recovery; improve integration of the informal sector in the waste economy; and increase funding for local initiatives that enhance community livelihood options and address the socio-equity gap via a circular economy.<br>• The short-term solution to minimising marine plastic pollution in the region is through improved waste collection and management, a prerequisite for more circularity.<br>• Urge municipalities and local governments to scale up measures to address widespread littering and open burning of plastics through increased waste collection efforts. |
| Recycling | • Urge governments to undertake measures to strengthen plastic-recycling capacity.<br>• Lessen the burden of entry and scaling for informal and formal actors. |
| Regional interventions for the Mediterranean | |
| Sustainable production, consumption, and lifestyles | • Consider plastic bans in the region, working within EU regulations.<br>• Develop and support measures that increase the value of after-use plastics and encourage the redesign of products and materials for end-of-life value and circularity.<br>• Consider implementing regional campaigns to reduce littering. |
| Waste collection systems | • Improve waste collection and management by 10%.<br>• Improve waste collection and management in 100 key cities.<br>• Improve wastewater collection and treatment. |
| Waste management | • Improving waste management, starting with waste collection, should be the priority, as this is the intervention showing the greatest leakage reduction over time. |
| Recycling | • Governments should undertake measures to strengthen plastic-recycling capacity. |

| Regional recommendations for Southeast Asia | |
|---|---|
| Sustainable production, consumption, and lifestyles | • Governments should consider ways to reduce the import and export of plastic waste.<br>• Review current regulations and procedures for the import of plastics and revise as appropriate.<br>• Consider campaigns to reduce the demand for, and use of, single-use plastics, especially on-the-go plastics.<br>• Consider implementing regional campaigns to reduce littering. |
| Waste collection systems | • Improve waste collection methods and coverage.<br>• Scale up of measures for plastic waste collection and recovery.<br>• Improve integration of the informal sector in the waste economy.<br>• Increase funding for local initiatives to enhance community livelihood options and address the socio-equity gap via circular economy. |
| Waste infrastructure | • Improve waste management infrastructure and waste collection. |
| Recycling | • Governments should undertake measures to strengthen plastic recycling capacity. |

*Source: National guidance for plastic pollution hotspotting and shaping action, pilot reports. (IUCN et al. 2020)*

### 4.1.3. Hotspots: proposed actions

All of the pilot studies present a series of limitations identified and respective actions to overcome them. These are summarised in Table 14.

**Table 14.** A set of proposed actions for consideration for four types of hotspot: polymer, sector, application, and waste management. These proposed actions are made with the aim to generate significant change to the plastic pollution situation in each of the pilot locations.

| Location | Polymer hotspots: proposed actions |
|---|---|
| **Kenya** | Illegal importation of plastic should be investigated.<br>Update the Comtrade database and support actions for additional polymer, waste management, and plastic pollution open data sources.<br>Increase the transparency of sectoral data that is available. |
| **Mozambique** | Performing an analysis of polymer consumption by sector, based on the Mozambican market, would improve the quality of the analysis.<br>Improve reporting of trade quantities at customs.<br>Gather additional knowledge on the existing recycling actors and their market. |
| **South Africa** | Improve the consistency of the South African Waste Information Centre (SAWIC) database by aligning data reporting practices across the country as well as setting clear sanitary management standards to distinguish between fully and partially complying landfills.<br>Consider building a sector-to-polymer mapping matrix based on the South African market to improve the quality of the analysis.<br>Gain insight on both primary production of synthetic rubber and management of waste from the automotive-tyre sector. |
| **United Republic of Tanzania** | Centralise information from all recycling actors on recycling quantities by polymer.<br>Investigate whether there is any primary plastic production.<br>Consult customs authorities to have a better view on the magnitude of illegal trade. |
| **Thailand** | Investigate the illegal trade of waste.<br>Improve tracking of waste trade by polymer type. This effort must be performed at a global level.<br>Having a sector-to-polymer mapping based on the Thai market would improve the quality of the analysis |
| **Viet Nam** | Have a better insight on the informal sector. This could be achieved by linking informal waste collectors (waste pickers and waste crew workers) to the formal recycling sector. |
| **Republic of Cyprus** | Contact formal recyclers to have a better understanding of how much of each polymer is being recycled in the Republic of Cyprus. |
| **Menorca, Spain** | Perform characterisation study of waste generation in Menorca at household level. |

| | Sector hotspots: proposed actions |
|---|---|
| **Kenya** | Gain a better understanding regarding the fate of medical waste in Kenya.<br>Gather information on the number of tyres being burnt in kilns (properly disposed of).<br>Investigate retread and reuse practices, which would lengthen the lifetime of tyres.<br>Engage in collaborative research projects to close the gap on these specific data. |
| **Mozambique** | Consult local hospitals to find out whether medical waste is incinerated.<br>Consult cement factories to know whether they incinerate tyres as fuel and how many per year.<br>Perform a census on commercial fishing gear and a littering survey among artisanal and commercial fishers. |
| **South Africa** | Gain insight on waste management in the automotive-tyre sector.<br>Gain insight on waste management in the medical sector. |
| **United Republic of Tanzania** | Gather information on the number of tyres being burnt in factory kilns and investigate whether there are reuse practices through retreading in Tanzania, which would extend the lifetime of tyres.<br>Gain a better understanding regarding the fate of medical waste in Tanzania. |
| **Thailand** | Collect more accurate data on the average lifetime of textile applications in Thailand and of the amount of plastic used in textile in earlier years.<br>Gain a better understanding regarding the fate of medical waste in Thailand. |
| **Viet Nam** | Include in sectoral research fish markets to explore value of waste mismanaged by this sector. |
| **Republic of Cyprus** | Provide resources (knowledge, training, collection equipment, etc.) to the local authorities for the development of separate collection systems.<br>Develop and implement training and capacity-building programmes.<br>Develop new job opportunities at local community level relating to plastic waste management.<br>Construction of a new sanitary landfill in Nicosia.<br>Completion of the 'green points' network in all districts.<br>Finalization of the closure and rehabilitation of the remaining non-compliant landfills.<br>Enhancement of national technical capacity for recycling or incineration.<br>Implement the Blue Standard to reduce plastic usage in bars, restaurants, and hotels.<br>Improve port (aviation and maritime) reception facilities for waste segregation, removal, and recovery.<br>Design and test zero-plastic ecotourism models that completely eliminate plastics from the supply chain and educate visitors about their own responsibility related to use of plastics. |
| **Menorca, Spain** | Implement DRS for certain beverage containers to facilitate the recovery of reusable containers.<br>Increase separate collection in municipalities through the implementation of economic instruments (municipal charges, landfill, and incineration taxes).<br>Implement the regulation of the sale and distribution of single-use plastic products on the market, in public premises and at public and festive events. |
| | **Application hotspots: proposed actions** |
| **Kenya** | Engage in collaborative research projects to improve data quality<br>Aim for a better understanding of the specific types of plastic bag that might be exempt from the ban, in order to assess their production quantity in Kenya. |
| **Mozambique** | Collect information on consumption quantities by packaging application in Mozambique, either by consulting retailers or by conducting a consumer survey. |
| **South Africa** | Engage in collaborative research projects to improve the knowledge base on all products, especially from the packaging sector. Collaboration with general and industrial retailers is advisable.<br>More detailed data on the production of bottles made of polymers other than PET would make it possible to have a complete picture for plastic bottles in South Africa. |
| **United Republic of Tanzania** | Collect information on consumption quantities by packaging application in Tanzania, either by consulting manufacturers and retailers or by conducting a consumer survey. |
| **Thailand** | Perform data collection on the ground, similar to that conducted by ICF and Eunomia in Europe (European Commission, 2018), in order to have a specific littering rate for nappies in Thailand. |

| | |
|---|---|
| **Viet Nam** | Engage in collaborative research projects for improved data. |
| **Republic of Cyprus** | Collect information on consumption quantities by packaging application in Cyprus, either by consulting manufacturers and retailers or by conducting a consumer survey. |
| **Menorca, Spain** | Sufficient information not available for Menorca. |
| | **Waste management: proposed actions** |
| **Kenya** | Conduct waste generation characterisation studies at household level in different cities to infer town-specific per capita waste generation quantities. Identify main tourist hubs, especially in rural areas, and gain a better understanding of plastic consumption by the tourism sector.<br>Consult recycling companies to gather information on the origin of recyclable waste. |
| **Mozambique** | Ask recycling actors whether they also recycle plastic waste coming from other cities or areas in Mozambique. |
| **South Africa** | Improve the consistency of the SAWIC database by aligning data reporting practices across the country as well as setting clear sanitary management standards to distinguish between fully and partially complying landfills. |
| **United Republic of Tanzania** | Centralise information from waste collection and recyclers.<br>Conduct waste generation characterisation studies at household level in additional cities and rural areas. |
| **Thailand** | For the areas with the highest waste generation, a more in-depth study could be conducted to better understand where waste is disposed of. |
| **Viet Nam** | Obtain detailed information of the origin of waste at various landfills and dumpsites. |
| **Republic of Cyprus** | Since all collected waste that is not exported for recycling is disposed of at landfill facilities, it is important to trace the origin of the waste ending up at each of the three integrated waste management facilities in Cyprus. This information will reveal how much plastic waste is collected in each province in addition to already known amounts of recyclables. |
| **Menorca, Spain** | Gather better insight on the fate of waste exported for recycling. Spain, for example, exports waste to Malaysia, Viet Nam, China, and Thailand, where some of the waste is mismanaged. |

*Source: National guidance for plastic pollution hotspotting and shaping action, pilot reports. (IUCN et al. 2020).*

## 4.2. Economic recommendations

### 4.2.1. Knowledge uptake

A selection of economic recommendations as part of a plastic-pollution mitigation and elimination strategy is provided in Table 15.

**Table 15.** An overview of the approaches taken for the economic briefs conducted for Menorca (Spain), Mozambique, and South Africa and the associated recommended knowledge-uptake plan.

| Location | Focus | Knowledge-uptake plan for action |
|---|---|---|
| **Menorca, Spain** | The cost-benefit analysis (CBA) methodology and approach evaluated the economic profitability of a deposit return scheme (DRS) for PET bottles. The CBA was carried out by examining a scenario without the DRS instrument, called the business-as-usual (BAU) scenario, and a scenario including a DRS. The objective of the CBA was to determine the economic implications of the implementation of the DRS for the local waste management system. The costs and benefits for the waste management system were the object of analysis. For the BAU scenario, this was done based on the 2021 *Plastic Pollution Hotspotting Report* results, stakeholder interaction, and literature review to obtain additional data, or estimates, when direct data were not available. | It is recommended to develop an impact evaluation of the waste management sector, assessing instruments for the implementation of circular-economy mechanisms in order to reduce plastic leakage. In 2020, the methodology for data collection and the literature review conducted were presented to OBSAM, in order to validate the research proposal with local stakeholders in Menorca. The study provides an assessment of policy instruments that will strengthen the implementation of a circular economy, with a particular focus on priority plastic hotspots. At least one intervention focused on increasing circularity within the waste management system will be selected, based on IUCN's criteria to define circular economy, to be evaluated based on its effectiveness and efficiency. This evaluation will be validated with project stakeholders. |
| **Mozambique** | This brief focused on determining the impacts of plastic pollution on fisheries and livelihoods. According to the results of the *National Guidance for Plastic Pollution Hotspotting and Shaping Action* national report for Mozambique, the fishing sector has the highest relative leakage of plastics, including leakage from gear loss at sea and leakage from overboard littering of packaging. The scope of the report outlined several plastic pollution impacts, including on the different types of fisheries, employment, and food security. Broader economic effects and the influence on export revenue, marine ecosystems, and marine biodiversity were examined. | IUCN will share the outputs from this brief for stakeholders in Mozambique to clarify the policy implications of the IUCN policy assessment and the in-depth assessment of EPR, linking all of these items to the National Plastic Pollution Hotspotting Report outcomes in order to support the production of an action plan. |
| **South Africa** | This brief determined that current beach clean-up efforts in Cape Town, South Africa were efficient in avoiding losses in the tourism revenue sector. It analysed how the efficiency of beach cleaning changes with the implementation of a DRS. To estimate the efficiency of a DRS, five scenarios were considered with different return rates of PET bottles by consumers (i.e. 74%, 86%, 94%, and 100%). The methodology included a sensitivity analysis to verify whether efficiency results were consistent if beach tourism is impacted less by beach litter than originally assumed. Nine different scenarios were considered for the sensitivity analysis. | IUCN will share the outputs from this brief for stakeholders in South Africa to clarify the policy implications from the IUCN policy assessment and the in-depth assessment of EPR, linking all of these items to the National Plastic Pollution Hotspotting Report outcomes in order to support the production of an action plan. |

*Sources: Jain, et al. (2021), Raes, et al. (2021), and Sanabria Garcia and Raes (2021)*

### 4.2.2. Recommendations: extended producer responsibility (EPR)

Generally, the two recommendations that can be applied to all countries included here, and to others considering EPR, are to first perform subnational and national policy assessments of existing laws and regulations that touch on and can influence plastic pollution across its life cycle; and to strongly consider establishing and enforcing national EPR policies and schemes that represent a clear and actionable response to address plastic pollution. A list of EPR recommendations for consideration is included in Table 16.

**Table 16.** A list of Extended Producer Responsibility (EPR) recommendations.

| Recommendations |
|---|
| • Identify gaps in legislation and how existing laws consider plastics, waste management and pollution.<br>• Producers need to be involved early in the assessment of the legal and operational ramifications. The government should establish a formal consultation mechanism with industry, NGOs, and external experts to develop an EPR framework suited to national needs and one that has full industry and private sector support.<br>• Confirm whether producers should manage the waste individually or collectively, and whether they do so on their own or together with municipalities.<br>• All stakeholders must clearly define their roles with respect to their legal obligations and responsibilities.<br>• Any EPR framework must consider the informal waste sector – the organisation, behaviour and number of waste pickers must be surveyed. This should include identifying the approximate number of informal workers, how and whether they are organised, which materials they handle and in which volumes, and the waste material flows through the system. The informal sector should be assigned targets and roles that support the material goals of the EPR.<br>• The current value-added tax on purchases of plastic waste should be removed to help the integration of the informal waste sector into an EPR system. Taxation should follow only when the EPR system and the informal waste collectors are functioning well.<br>• The EPR framework must include improvements to the national waste infrastructure, including organising collection, and the construction of new waste intermediaries such as material recovery facilities and landfills.<br>• Utilise existing waste bins and convert them into recycling bins for collection, increasing convenience to consumers.<br>• Implement better management of residue waste after sorting – even well-operating EPR systems do not divert all waste.<br>• EPR systems will help to alleviate financial pressures on the public sector; use the freed up additional resources to develop improved disposal options.<br>• Develop and implement public education campaigns to provide consumers with information and awareness about environmental pollution issues and better waste-handling practices at the source.<br>• The need for reinforcement of leadership for the integrated and concerted implementation and enforcement of relevant laws and necessary measures should be evaluated for a strong EPR framework.<br>• Establishment of landfill taxes to phase out landfilling of recyclable and recoverable waste should be considered.<br>• Consider that EPR regulations may be more effective if they require transparency on data about products placed on the market and about generation and management of waste, as well as the obligation for producers to cover 100% of the waste collection and management costs. |

*Source: IUCN, 2021*

### 4.2.3. Recommendations: deposit return schemes (DRS)

Implementing a DRS can contribute to the creation of jobs in retail, bottle collection and waste management, as well as administrative staff to ensure the smooth functioning and implementation of the DRS. Other potential benefits are also generated, such as a reduction in waste management and collection costs, reduced landfill costs, reduced household waste disposal costs, reduced illegal dumping, increased recycling, and improved marine water quality.

1. DRS should be considered for PET drinking bottles.
2. A system of reverse vending machines (RVMs) instead of manual collection has been shown to be effective in some locations and should be considered.
3. RVMs should be installed in supermarkets for broad use.

### 4.2.4. Recommendations: circular economy

Scaling up small businesses that focus on circular economy is strongly recommended. The results of the circular economy components of the IUCN Close the Plastic Tap programme demonstrate less waste, more value, and increased livelihood options for the communities where a circular economy project was supported. Each organisation generated innovative, dynamic economic models designed to heal the ocean and benefit communities.

Small-scale circular economy projects in coastal communities that include women can play a key role in plastic pollution interventions. These circular economy model projects could be linked with broader waste management at a national level and could involve tourism operators for waste collection. They should ideally create markets for recycled plastics, such as those that focus on certifying ocean-bound plastics for recycling.

Boosting the circular economy through new regulations should include means to determine how and when a waste material can be reused, as well as limitations on incineration, as this method is not in line with a circular economy. Furthermore, the circular economy should not be reduced to simple recycling.

National action and regulations are a crucial part of eliminating plastic pollution and moving towards a circular economy. However, at the regional and global levels there are many conventions and actors that can promote circular economic action, create plastic pollution action plans, and frame the issue to guide nations.

### 4.2.5. Recommendations for regional and global action

A global treaty on plastic pollution is in process, set to become an international legally binding agreement by 2024. As noted in *Science* (Simon et al., 2021), there is a strong argument for an "international legally binding agreement that addresses the entire life cycle of plastics, from extraction of raw materials to legacy plastic pollution."

The *Science* article sets out three goals to anchor a solid agreement with action at its core:

1. Minimise production and consumption of virgin plastics
2. Facilitate safe circularity of plastics
3. Eliminate plastic pollution in the environment.

The 2021 IUCN Marine Plastic Pollution brief asks why there is a need for a global treaty when the global mechanisms addressing plastic pollution already exist. The International Convention for the Prevention of Pollution from Ships (MARPOL) bans ships from dumping plastic at sea but the ocean has not benefited from reductions in plastic pollution because of the land-based sources that continue to pollute it, and emissions have accelerated at a pace commensurate with plastic production. For this reason, the MARPOL Annex V is limited to maritime emissions, whereas "80% of plastic enters the ocean from land." (Borrelle et al., 2017). Accelerating the processes of a global treaty on plastic pollution will be more effective than voluntary plans, as "the scale and pace of solutions must match the scale and pace of emissions." (ibid). The endorsement by 175 countries for the UNEA5.2 Resolution, "End plastic pollution: Towards an international legally binding instrument" is a positive step in the right decision for the planet. IUCN supports this Resolution and will continue its work researching and advising stakeholders on the elimination of plastic pollution with renewed vigour and hope.

As of 2 March 2022, a global treaty resolution titled, "End plastic pollution: Towards an international legally binding instrument"[5] was gavelled at the United Nations Environment Assembly in Nairobi, Kenya. In total, 175 nations endorsed the agreement that addresses the full

5 Draft resolution is available here: https://wedocs.unep.org/bitstream/handle/20.500.11822/38522/k2200647_-_unep-ea-5-l-23-rev-1_-_advance.pdf?sequence=1&isAllowed=y

lifecycle of plastic and the geography of plastic waste, from source to sea. Plastic production has risen exponentially in the last decades and now amounts to nearly 400 million tons per year– a figure set to double by 2040 per UNEP (2022).

Regionally, recommendations for, and actions proposed to, conventions, such as the Nairobi Convention, need to be implemented. As the regional recommendations included here note, there is much to support and act upon that will lead to real change.

The Nairobi Convention countries[6] will benefit from a harmonised quantification of plastic leakage and impact, allowing them to establish a baseline for benchmarking and tracking the progress of interventions. From the countries where the assessment has been undertaken, there is a clear demonstration of the need for comprehensive, consistent, comparable, and credible metrics on marine plastic pollution in the West Indian Ocean (WIO) region, based on a methodology that harmonises existing data, tools and resources. “Consistent, harmonised and inter-operable methodologies will be critical to ensuring that studies such as these are useful to governments and other stakeholders and are not creating more confusion on a complex topic.” (Dixon, 2021).

The results from the assessments aimed to support and inform the review of important action plans and strategies developed within the region to address marine plastic pollution. The results were timely in providing metrics to influence the review and refinement of the objectives of Decision CP.9/3 of the Nairobi Convention. These include the regional strategy on the management of marine litter and microplastics and the work of the marine litter regional technical working group in the WIO region; the development of responsive and action-oriented capacity-building programmes on marine litter and microplastics; the implementation of action programmes for outreach and public awareness activities on the impact of municipal waste and marine litter on marine species and their habitats; and exchange of expertise, best practice and lessons learned.

National and regional plastic pacts are another source of inspiration that are leading to action against plastic pollution. Ensuring that plastic pacts inputs (where a pact exists) are included in the policy-making process is a key recommendation for effective results. Currently, as part of the Ellen MacArthur Foundation (EMF) Plastic Pact Network, there are national plastic pacts in Chile, France, the Netherlands, Portugal, South Africa, the UK, the US, Poland, and Canada. Regional pacts include the European Plastics Pact and the Australia, New Zealand, and Pacific Islands Plastics Pact. India also has a national plastics pact that is not part of the EMF network.

## 4.3. Harmonisation and transparency

With UNEP, IUCN provides a replicable harmonised, methodological framework for plastic pollution hotspotting, which, along with IUCN’s other work on policy, economics, and circular economy, allows stakeholders at national, sub-national, and local levels to identify plastic leakage and impacts and implement appropriate actions. The research presented is a set of national and sub-national baselines, so that plastic pollution can be monitored and the success of interventions can be evaluated.

Without effective training on the methodologies included above, mainstreaming of this work will not be possible. Capacity is needed on the ground and at national and regional levels in order to perform this work, and also to understand its implications and provide the means to move forward with commitments to change and innovative policy, economic, and business approaches. Assessment tools versus monitoring tools in the context of each country, the use of appropriate indicators, the relevance

6 Comoros, France, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia, Tanzania and the Republic of South Africa.

of the integrated approach – all of these aspects are important to consider when attempting to determine efficacy. Municipal, national, and regional actors need to communicate and cooperate to ensure that assessments from local areas will make national assessments stronger and can feed into regional results for a bigger picture of the challenges and solutions.

The need for data transparency, replicable, harmonised methods, and ongoing monitoring of results, are the keys to the elimination of plastic pollution clogging the ocean. The UNEP/IUCN *National Guidance for Plastic Pollution Hotspotting and Shaping Action* provides an effective interface between science-based assessments and policy making. Countries and cities can use their data with the UNEP/IUCN National Guidance to close the knowledge gap, find the root sources of plastic pollution and identify solutions. These efforts will benefit the trade, import, and export of plastics as more research is conducted and more, higher quality data is produced.

## 4.4. Recommended stakeholder actions

Based on the information presented in this publication, a summary of recommended stakeholder actions is presented in Table 17, as a synthesis of who needs to prioritise which actions if the plastic pollution crisis is to be addressed in a meaningful manner.

**Table 17.** Recommended stakeholder actions.

| Stakeholder | Recommended actions |
|---|---|
| **Regional and global conventions** | 1. Support the effort to implement a global treaty on plastic pollution.<br>2. Urge governments to strengthen plastic recycling capacity, lessen the burden of entry and scaling for informal and formal actors, and improve adherence to established norms, standards, and licensing requirements as applicable.<br>3. Encourage governments to implement measures that discourage the production and import of plastic objects that do not benefit from a recycling solution within the national authority.<br>4. Facilitate capacity building and knowledge generation for municipalities and local government to address plastic pollution in major cities, towns, and peri-urban areas.<br>5. Urge municipalities and local governments to scale up measures to address widespread littering and open burning of plastics through increased waste collection.<br>6. Urge governments and the private sector to develop and support measures that increase the value of after-use plastics and encourage the redesign of products and materials for end-of-life value and circularity.<br>7. Call for scaling up of measures for plastic waste collection and recovery, improved integration of the informal sector in the waste economy, and increased funding to local initiatives for enhanced community livelihood options and to address the socio-equity gap in the circular economy.<br>8. Seek opportunities to find synergies between these actions and others that address SDG12, “Ensure sustainable consumption and production patterns.” |
| **National environmental agencies** | 1. Identify, standardise, and validate tools and methods for assessment at a national level to contribute to the development of harmonised methods to mitigate and eliminate plastic pollution.<br>2. Undertake plastic pollution hotspotting and strengthen national waste data systems.<br>3. Prioritise improving waste management and collection systems.<br>4. Review the National Hotspotting Reports noted herein for guidance on instruments and interventions. |
| **Policy and decision makers** | 1. Create a national action plan to address marine plastic pollution and its impacts.<br>2. Determine how EPR and DRS can reduce plastic pollution in the local context.<br>3. Ensure appropriate plastic pacts inputs (where a plastic pact exists) are included in the policy-making process. |

| | |
|---|---|
| **Private sector, plastics manufacturers, associations, plastics pacts** | 1. Scale up internal capacity to assess and address plastic leakage along the value chain.<br>2. Invest in circular economic models.<br>3. Enable knowledge sharing and coordinated action through local, national, and regional networks.<br>4. Eliminate unnecessary plastic packaging through redesign and innovation.<br>5. Move from single use to reuse of plastics.<br>6. Ensure all plastic packaging is reusable, or recyclable.<br>7. Increase recycled content in plastic packaging and lobby for legislative changes where needed.<br>8. Advocate for EPR policies where they are not in place.<br>9. Contribute to institution building.<br>10. Consider voluntary financial contributions that are equivalent to EPR to set an example for industry and policy makers to follow. |

*Source: IUCN, 2021*

# 5. Lessons learned and conclusions

**This chapter covers** the lessons learned related to pillars of knowledge, policy, capacity, and business as well as where in the plastics life cycle the learning occurs. Also included is an overview of the monitoring, evaluation and learning aspects to guide strong implementation. Finally, this chapter provides conclusions focusing on the solutions offered to stem the flow of plastic into the marine environment, conclusions related to the research, presented within the broad scope of the plastic pollution problem facing humanity, and which effective actions will prevent plastic from harming the ocean and marine biodiversity.

The main sources for the material in this chapter are *Plastic Pollution Hotspotting and Shaping Action: Regional Results from Eastern and Southern Africa, the Mediterranean, and Southeast Asia* (Pucino et al., 2020), the *National Plastic Pollution Hotspotting Reports* (IUCN et al., 2020), and the 2021 outcome harvesting report for the MARPLASTICCs project (IUCN, 2021).

## 5.1. Summary of lessons learned

### Knowledge

From the beginning of the Close the Plastic Tap programme there was an emphasis on the generation of knowledge products, and their dissemination, in order to build capacity. At the foundation of any plastic pollution assessment must be the cornerstones of knowledge, including tools, methods, and models upon which to build. IUCN has developed tools to assess the types and amount of plastic leaking into the environment, from source to sea, and has worked closely with countries to co-generate credible, salient, and legitimate data and analysis to understand their current plastic leakage status, set targets, agree, and implement actions, and track progress toward targets over time.

### Capacity

Lessons learned from the first round of support for circular economy initiatives pointed to stark challenges faced by these local initiatives, challenges that undermine their ability and capacity to scale, replicate and sustain their impact. IUCN is building on the lessons from the first set of projects to extend the criteria for identification and selection of the next generation of projects. The use of innovative approaches to address plastic pollution, while creating synergies with sustainable conservation and management of marine and coastal resources and habitats, and boosting people's livelihoods, is paramount.

In 2021, IUCN established in Eastern and Southern Africa the Circular Plastics Economy Innovation Lab (CPEIL) as a vehicle to inform the structure of a new set of initiatives. These new initiatives support coastal communities by creating jobs and economic opportunities that are desperately needed in this time of crisis, but they also reduce pressure on coastal and marine resources, which are a critical factor for the resilience of these communities. Entrepreneurial communities across the region are the enablers of the circular economy through their action to collect and recover

plastic and other valuable waste. While a 'true' shift towards a vibrant circular economy will involve technology, infrastructure, policy and process changes, the hundreds of thousands of community members who work in the informal sector are the front line in diverting plastic waste out of the environment.

## Policy

Many countries struggle to find the appropriate legal and policy frameworks to deal effectively with plastic waste and pollution. The policy research conducted by IUCN highlighted the various national and subnational challenges that limit the strengthening of frameworks that should: include plastic in solid waste management; enable EPR and DRS where appropriate; and reinforce needed reforms to improve plastic pollution governance. One significant gap in legislation that was found was that plastic pollution has not yet been treated as a major threat to the marine environment – specific policies for the prevention of marine pollution need to be developed where they are lacking. As countries embark on movements to enact environmental and natural resource policies and legislation that incorporate international environmental principles and obligations, they can establish and empower national institutions to ensure that implementation benefits the ocean.

Some countries have a suite of environmental laws, including dedicated plastic bag bans or regulations, and a variety of legal instruments available to address plastic pollution. However, in many cases they have yet to be fully utilised or are still in the process of implementation. The need for a global plastics treaty is reinforced by all of these challenges and such a treaty should be designed and implemented in a way that removes barriers and spurs change.

## Business

The private sector is a necessary partner in effectively addressing plastic pollution. Quantis, working with the IUCN Close the Plastic Tap programme, created a set of guidelines – the Plastic Leak Project (PLP) – that provide businesses at all stages of the value chain with a robust method for calculating and reporting estimates of plastic and microplastic leakage at both the corporate and product level. The guidelines are similar in format to the UNEP/IUCN National Guidance, in that they generate a plastic leakage assessment with which companies can locate hotspots, understand how much leakage is occurring, and identify the factors contributing to plastic pollution across their value chains. Engaging the private sector presents many opportunities to tackle plastic pollution, but deploying the knowledge product (the PLP tool) took IUCN a considerable amount of time and brought several challenges, as outlined below in Table 18.

**Table 18.** Summary of lessons related to marine plastic pollution across the pillars of knowledge, policy, capacity, and business.

| Knowledge | Policy | Capacity | Business |
|---|---|---|---|
| Create and maintain a strong monitoring, evaluation and learning system from the beginning. | Consult with local experts for all policy research, including universities, policy makers, and civil society actors advocating for change. | Create and support environments for the existence of small- and medium-sized circular economy initiatives that aim to reduce the amount of plastic leaking into the marine environment. | Create a strategy for business actors to be engaged, and to promote circular economic models. |
| Generate all knowledge products in locally accessible formats and languages and host meetings/webinars to share them with the stakeholders. | Establish a set of economic methodologies and test them across several scenarios; and engage with policy makers and other stakeholders to inform the process. | Follow the IUCN Community-based Guidelines for Circular Economy projects to build capacity. | Work with manufacturing and plastics associations to understand needs; find leakage hotspots that are common across many manufacturers to generate innovation for change. |
| Create cross-component links between knowledge, hotspotting research, policy (including economics), capacity, and business for stronger outcomes. | Identify policy gaps that are hampering efforts to eliminate plastic pollution and link national hotspotting results to these gaps to create a mitigation plan with prioritised instruments. | Before beginning, assess the skill levels among team members and partners to determine skills gaps. Create learning environments that will build capacity. These can range from cross-training centres and training of trainer methods to formal training tools and improving skills. | Foster local and national business platforms for engagement. |
| Establish enabling environments with NSCs to facilitate dialogues on the knowledge (and other components) needed, trust the experts, and encourage transparency in plastic pollution research and data collection. | Enact environmental and natural resource policies and legislation that incorporate international environmental principles and obligations. | Funding is needed to address the crisis: investment in waste infrastructure capacity, innovative methods to upcycle plastic waste, and livelihoods should all be prioritised. | Create clear business cases for the implementation of EPR, DRS and other solutions that will benefit society and business. |
| Boost data collection capacity at national levels. | Design policies to support the creation of data repositories and open-access, science-based decision making. | Assess national levels of capacity for action and identify barriers to action preventing circular economic models from being implemented. | Increase business capacity for understanding plastic leakage along the value chain through tools such as the Quantis Plastic Leak Project. |
| Draw on the knowledge of the informal waste sector and their practical experience to maximise recycling under local market conditions. | Design and implement EPR schemes that are participatory and negotiated, and are inclusive of the informal sector and waste pickers. | Mentoring and capacity building on skills, in the form of innovation labs to transfer knowledge and teach circular economy models and methods, should be encouraged, and funded. | Increase dialogue with businesses about plastic pollution. |
| Share and implement agreed globalised formats for data and methodologies. | Establish a suite of standardised economic tools to assess the effectiveness of policies and allow robust comparisons | Reduce dependency on plastic and insist that recycling cannot be the only solution: stakeholders (authorities, NGOs, universities) need to work to eliminate plastic pollution at source. | Establish national plastics pacts. |

*Source: IUCN, 2021*

## 5.2. Monitoring, evaluation, and learning

An important part of projects that aim to reduce plastic pollution is monitoring, evaluation and learning (MEL). Without a strong, consistent MEL plan established at the beginning of a project, there is no effective means to measure progress toward the desired outcomes and no clear path to determine whether the interventions of the project are working and are aligned with each project's theory of change. The theory of change can be updated as a project progresses, and as monitoring provides insights into how the project is meeting its targets or objectives.

Within the MARPLASTICCs project, a theory of change was developed and updated annually as the project evolved and progressed toward its objectives.

IUCN has a team of MEL experts that train project members on methods of MEL to ensure project success. MEL is an ongoing process that occurs at various points in each project cycle and is meant to be adaptable as needed, if projects encounter challenges or are in some way blocked from achieving their objectives. Building the framework for monitoring, increasing the capacity of project teams, and regular check-ins to capture and harvest outcomes are key to an effective project and should be a part of any plastic pollution prevention project, based on resources available.

It is important to use MEL tools throughout the project to track progress, to find project gaps in implementation, and to visualise the results over the course of time, especially how these changes map to the points in each project's theory of change. A suite of tools was used to track the MEL outcomes of the research covered in this publication. These tools included spreadsheets and an outcome harvesting dashboard, both of which the project team updated regularly. The project team used them to track meetings, events, external project knowledge uptake, policy updates, stakeholder engagement and partnerships, where changes occurred, and evidence of progress. Prompted by twice-yearly project progress review to use tools that included collaborative virtual whiteboards and data visualisation software packages. Additionally, it was necessary to build capacity of all team members and partners for impact monitoring and management skills within the circular economy project teams, to measure results and outcomes.

### 5.2.1. Outcome harvesting example

IUCN defines an outcome as *an observable and significant change in a societal actor's behaviour, relationships, activities, policies, and/or professional practice, that has been influenced by an IUCN project intervention*. The results of an 'outcome harvest' demonstrate impacts and results to understand local, national, regional, and global changes to the plastic pollution situation, and to help identify limits, gaps, and successes.

The MARPLASTICCs project successfully implemented outcome harvesting. A summary of key outcomes, drawn from the full MARPLASTICCs outcome harvesting report (IUCN, 2021a), is shown in Table 19.

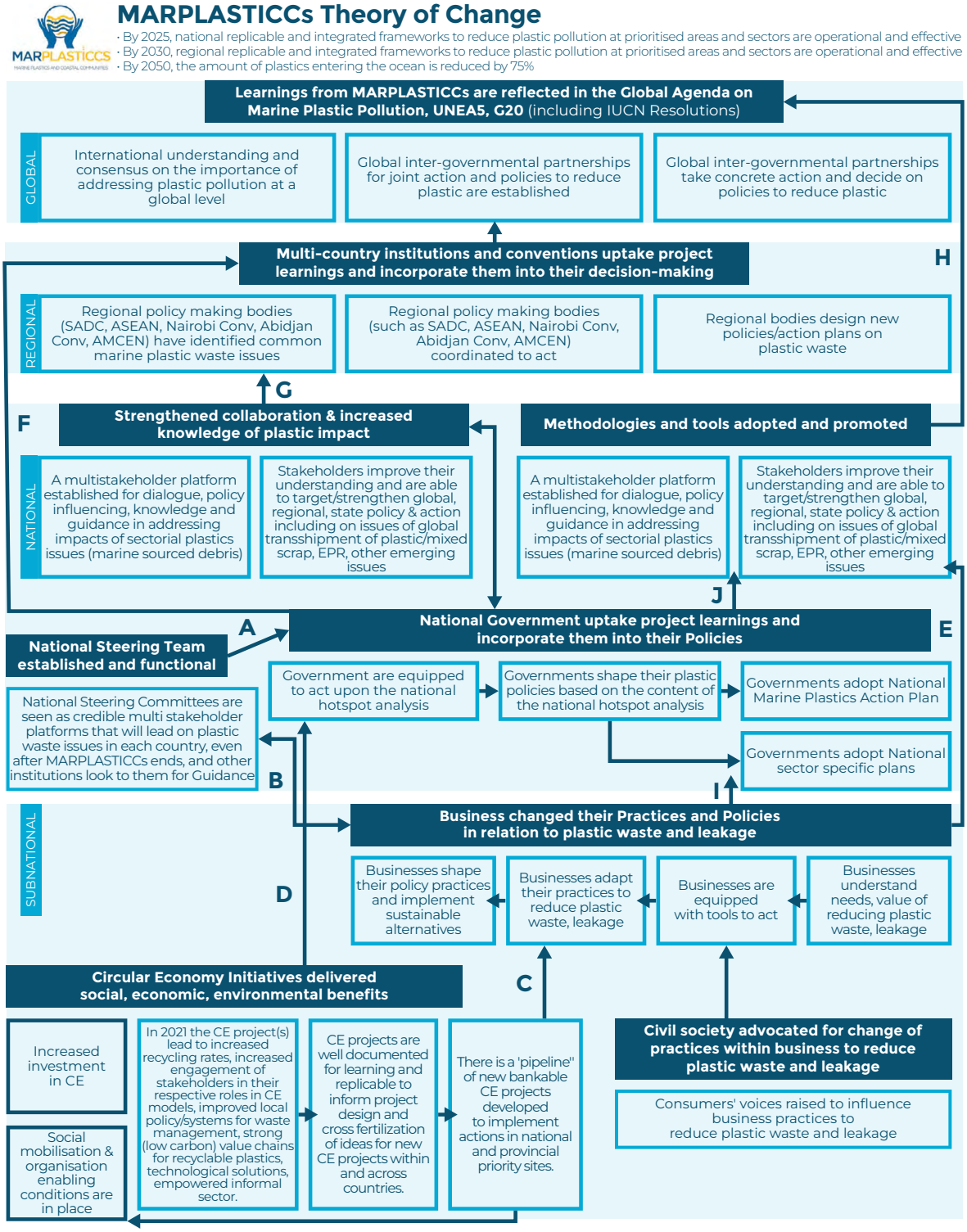


**Figure 9.** The MARPLASTICCs Theory of Change. Source: IUCN, 2021.

**Table 19.** Examples of key outcomes from the MARPLASTICCs project which had a Monitoring, Evaluation, and Learning plan used from the beginning of the project.

| **KNOWLEDGE**: Understanding the state and impact of plastic pollution in the Indian Ocean and Asia Pacific regions | **CAPACITY**: Local and regional capacity building to facilitate national action to control plastic pollution | **POLICY**: Supporting national and regional policy frameworks and legislative reform processes to address plastics | **BUSINESS**: Engaging and mobilising business actors in support of effective management and reduction of plastic pollution |
|---|---|---|---|
| Targeted national decision makers are equipped with the right knowledge from the project. | Targeted circular economy actions supported and audiences informed by demonstrations, lessons learnt. | Targeted plastic leakage related policies enhanced. | Targeted companies that implement improved leakage reduction practices. |
| Globally, MARPLASTICCs' outcomes across all four areas are well documented. MARPLASTICCs contributed to these outcomes by creating an enabling environment. IUCN used MARPLASTICCs' policy and economic outcomes as part of a GIS digital story, which was posted as a news story December 2021 and which explains how the outcomes were used in a story map. The story map presents the MARPLASTICCs' Holistic Solution Package, how the results were accomplished. The variety of tools and knowledge products that were built by the project provided direction to policy makers, manufacturers, and the waste management sector. Tools included the UNEP/IUCN National Guidance for Plastic Pollution Hotspotting and Shaping Action, assessments of plastic pollution, policy studies, circular economy models, private sector engagement, and economic guidance. | | | |
| **KENYA:** MARPLASTICCs made significant contributions to the National Marine Litter Management Action Plan (2021–2030), whose development was spearheaded by the National Environment Management Authority (NEMA). MARPLASTICCs also informed the baseline and targets of the Kenya Plastics Pact. The hotspotting assessment was crucial to this progress. (Outcome 147)<br><br>**MOZAMBIQUE:** MARPLASTICCs has contributed to the development of the national action plan on marine litter, which is still in process. The hotspotting assessment was integral to the drafting of the plan. **(Outcome 157)** | **MOZAMBIQUE**: The Circular Economy project of 3R has continued to provide important services that prevent plastic waste from ending up in the ocean: an article and video showcase the community's engagement in the market-based solution that contributes to cleaning the environment and providing income, with 697 waste pickers now working in Vilanculos. The initiative had collected over 20 t of plastic waste as of November 2021. (Outcomes 39, 65, 98, 100)<br><br>**THAILAND**: The Circular Economy project offshoot, at Ranong Recycle Centre was certified by Zero Plastic Oceans in November 2021 for its Ocean Bound Plastics, a huge step for the markets selling recycled plastic. In 2020, the Thailand Circular Economy project for MOKEN fishers collected 121,305 kg of plastic that may have once been a threat to the ocean. (Outcomes 5, 64, 161). | **KENYA**: The Government of Kenya and its partners are strengthening the extended producer responsibility (EPR) framework, which IUCN supported via its in-depth EPR policy assessments. (Outcomes 71, 95)<br><br>**SOUTH AFRICA**: A new publication of IUCN with the University of Western Cape, "Managing waste in lower-income communities by formalising illegal dump sites: Learnings from Drakenstein Municipality" is being used as guidance for the need for stakeholder cooperation and inclusion for successful behavioural changes. (Outcomes 41, 90, 125, 141, 145)<br><br>**THAILAND**: MARPLASTICCs has influenced the Thailand Food and Drug Administration, specifically for the regulation preventing the use of secondary plastic in food and beverage products. (Outcome 18)<br><br>**VIET NAM**: Viet Nam developed an action plan on reducing plastic waste in the fisheries sector, a huge win with many MARPLASTICCs inputs over four years. (Outcomes 74, 106) EPR in Viet Nam is also moving very rapidly, with inputs and guidance from IUCN. (Outcomes 43, 62, 107, 117, 162) | **THAILAND**: Thai Union, a global seafood provider, has engaged IUCN in training on plastic leakage in their value chain as of December 2021, after a review of the hotspotting assessment and an online seminar on the Plastic Leak Project Tool convinced them to examine their product value chains. (Outcomes 60, 108, 119) |

*Source: Outcome harvesting report, IUCN, 2021a.*

### 5.2.2. Value for money

An additional tool that IUCN has begun to use to monitor the impact of its projects is the value for money (VFM) assessment, and IUCN is using it to asses a part of the MARPLASTICCs project. To better understand and demonstrate the project's contribution to several outcomes related to the project objective (to ensure governments and regional bodies within the Eastern and Southern Africa and the Asia Pacific regions promote, enact, and enforce legislation and other effective measures that contain and reduce marine plastic pollution) the MARPLASTICCs project team decided to conduct a VFM assessment. This assessment focuses on the action plan on plastic waste management in the fisheries sector that the Government of Vietnam adopted[7] in February 2021, and on the Circular Economy initiative implemented by ReForm in Cham island, Viet Nam.[8]

It is integral to a successful project to have strong MEL processes in place. Without these, tracking whether a project intervention caused a policy change or whether a project partner achieved a target is not possible. As with all aspects of a science-based approach to eliminating plastic pollution, a project's MEL plans and the project team needs to embrace these processes for good results.

## 5.3. Conclusions

### 5.3.1. Established practices

Recent efforts to deal with plastic pollution include well-known practices of regular beach and ocean clean-ups, recycling efforts, monitoring efforts, and implementing policy instruments such as bag bans or plastic bottle taxes. However, these efforts are not enough. Combining these with a deeper understanding of the issue and innovative, holistic practices is the only way to close the plastic tap. A lack of coherent approaches to plastic production, use, and waste create the gaps that prevent the development of effective systems (and their implementation) to eliminate plastic pollution.

The key takeaway from this research is that there is a pressing need to use **science-based plastic leakage assessments to drive policy and behavioural changes that will reduce plastic pollution**. Furthermore, IUCN's comprehensive methodology and tools **provide a holistic package to build capacity for stakeholders to understand and manage marine plastic pollution.**

From local to national and regional levels, a need for better quality data is obvious. Current practices of monitoring plastic waste and pollution should be bolstered with the creation of hotspotting assessments and linking those hotspotting results to legislative and economic policies that will benefit each country. Today's inefficient and ineffective waste management needs to be re-examined using the recommendations in this report to move rapidly toward a plastic circular economy.

Stakeholders should consider results of the hotspotting assessments, the policy reviews, the economics research, and the progress on the circular economy models to determine how all components contributed to or will contribute to a reduction or elimination in plastic leakage. These aspects can then feed into national action plans to eliminate plastic pollution. The lessons learned can be packaged into a scalable blueprint for use by regional bodies to share with other national authorities.

7 For more information, please see: https://www.iucn.org/news/viet-nam/202103/viet-nam-develops-action-plan-reducing-plastic-waste-fisheries-sector#:~:text=The%20action%20plan%20aims%20to,communities%2C%20fishermen%20and%20-business%20sector.

8 ReForm Cham Island information and video: https://www.iucn.org/news/viet-nam/202102/marplasticcs-video-series-reform-cham-island-landfill-project-a-circular-economy-initiative-led-evergreen-labs-viet-nam

It is important to recognise the limitations of current practices that are using existing data sets and the need for increased data sharing. Furthermore, additional primary research is essential to better understand and monitor plastic waste flows that will lead to the development and implementation of solutions. These efforts will only be effective if there is harmonisation within and between the methodologies. (Dixon, 2021).

Overall, plastic pollution in the marine environment plays a central role in the degradation of marine ecosystems and the services these ecosystems provide. An understanding of the locations of hotspots and vulnerable species and habitats can be used to generate plastic pollution actions plans that will benefit marine biodiversity.

### 5.3.2. Innovative framework for implementation

IUCN has provided a structured, comprehensive solutions package to identify the drivers of plastic leakage, assess policy and economic gaps, bolster circular economic models, and build capacity, and work with multiple stakeholders including businesses.

The knowledge products in the IUCN Close the Plastic Tap programme will continue to be shared and used to assist governments and regional bodies to strengthen, develop and implement legislation and other measures to reduce plastic pollution. By equipping governments, the private sector and civil society with tools, knowledge, capacity and policy options, there is a clear path to a circular economy that prevents plastic from polluting rivers and the ocean. The tools and methods shared here ensure that the full life cycle of plastics is taken into consideration, not just the impacts of downstream marine litter.

IUCN encourages decision makers at local, national, and regional levels to consider the recommendations above. National governments should consider creating plans of action when determining the most effective steps to address marine plastic pollution. An enabling environment that is supported by multi-stakeholder groups and includes the four components of knowledge, policy, capacity, and business ensures that policy and decision makers working on plastic pollution mitigation planning and implementation are empowered to generate effective solutions. Figure 9 explains the framework.

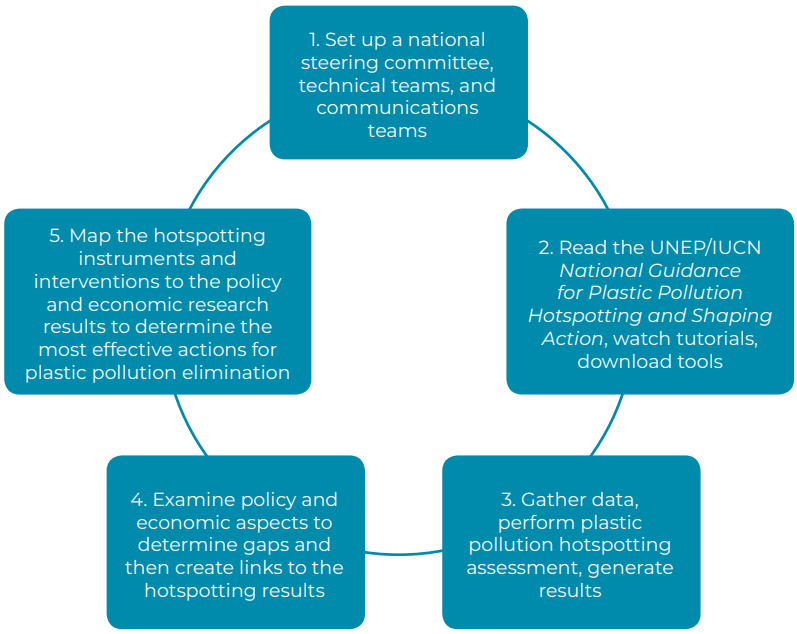


**Figure 10.** The process for a comprehensive plastic pollution assessment. Source: IUCN, 2021.

#### 5.3.2.1. Who can do this work?

**1. Set up a national steering committee, technical teams, and communication teams**

To truly manage and mitigate, if not eliminate, plastic pollution, national environmental entities or local waste management agencies need to examine the scope of the issue and decide what they wish to address. Setting up the appropriate teams is the first step to dealing with plastic pollution.

One of the main value additions that IUCN provides when examining plastic pollution is the strong network and convening power of the organisation – and the ability to cross-train stakeholders based on previous IUCN experience. IUCN's solution for closing the plastic tap begins with being able to assist national actors to identify, model, and secure the participation of the correct stakeholders, which can lead to an enabling environment for change.

Plastic pollution negatively impacts all nations, and, as such, this publication was written in the hope that more countries would take up the models presented to be able to manage their plastic pollution problems to improve the health of their national environments.

#### 5.3.2.2. How can one prepare for a plastic pollution hotspotting assessment?

**2. Read the UNEP/IUCN *National Guidance for Plastic Pollution Hotspotting and Shaping Action*, watch tutorials, download tools**

IUCN strongly encourages the uptake of the *National Guidance for Plastic Pollution Hotspotting and Shaping Action,* which is available in English, Portuguese, and Spanish. Every table and chart included in this publication is a direct result from following the methodology in this Guidance. For most people working in waste management, recycling, or environment ministries, the Guidance and process should be simple to follow. Please refer to Annex 1 for more information on the methodologies.

There is a step-by-step tutorial[9], an online seminar, and several video guides posted on the IUCN and UNEP websites that walk users through the process of a hotspotting assessment.

An understanding of plastic pollution is essential and current datasets used in the tools to determine the true scale and scope of the issue.

#### 5.3.2.3. How can one move from theory to practice to tackle plastic pollution?

**3. Gather data, perform plastic pollution hotspotting assessment, generate results**

Obtaining accurate information and using it as the basis to justify chosen priorities to reduce plastic pollution is essential for success. Especially where there is a lack of data, countries need to establish means to address data gaps, considering that collecting data for all the parameters across very large areas is neither feasible nor allows for enough coherence across multiple data sources. Furthermore, sharing data openly will allow for better quality results globally. Data will likely be one of the key targets for improvement in the implementation of a global plastics treaty. Supporting data sharing and improvements to data gathering and monitoring are cost effective methods to help reduce plastic pollution: the better the data, the easier it is to identify and address the key questions of what is leaking, where is it leaking, and why is it leaking.

9 The Tutorial is presented online here: https://plastichotspotting.lifecycleinitiative.org/tutorial/. A webinar is available here: https://www.iucn.org/theme/marine-and-polar/our-work/close-plastic-tap-programme/marplasticcs/events-and-webinars

Once a plastic pollution assessment is under way, the tools for modelling and mass balancing are key to filling data gaps and generating robust and coherent metrics. The data reconciliation process developed within the UNEP/IUCN *National Guidance for Plastic Pollution Hotspotting and Shaping Action* has proved useful to achieve the right level of information to inform the hotspotting process, balanced with resource limits for data collection.

The use of the Guidance by others outside of the projects covered by this report has facilitated learning and proved that there is an appetite for harmonised methodologies to address the challenge of plastic pollution. Countries outside of the IUCN programme are using the UNEP/IUCN *National Guidance for Plastic Pollution Hotspotting and Shaping Action* as part of new hotspotting efforts in Latin America, South Asia, and Europe.

Outcomes of the plastic pollution assessments include instruments to create change and interventions to be prioritised for that change.

#### 5.3.2.4. How can one integrate policy and economic aspects?

**4. Examine policy and economic aspects to determine gaps and then create links to the hotspotting results**

Viewing the hotspotting reports in a very structured way has been a revelation for many stakeholders involved in this work, prompting actions on policy changes, such as the February 2021 Viet Nam Ministry of Agriculture and Rural Development (MARD) Decision 687/QD-BNN-TCTS to approve the action plan on marine plastic waste management in the fisheries sector (2020–2030). The decision has received high appreciation from relevant stakeholders because this is the first action plan to reduce plastic waste pollution in the fisheries sector in Viet Nam.

As shown in Chapters 3 and 4, there is economic evidence that demonstrates that a combined set of efforts to remove plastic waste from the environment, along with other measures to move towards a circular economy and the implementation of deposit refund schemes or extended producer responsibility, among other actions, will produce benefits that directly improve the social, economic, and environmental contexts in which they are used. There are direct benefits to biodiversity when plastics are removed from the ocean, but as the research above demonstrates, the economic benefits are also clear. This alone should be a motivating factor for all countries, especially considering the many nations working towards post-COVID economic recovery efforts.

#### 5.3.2.5. How does one use the hotspotting results to generate and implement action plans?

**5. Map the hotspotting instruments and interventions to the policy and economic research results to determine the mosz effective actions for plastic pollution elimination**

Using the tools and methodology to identify and prioritise interventions, based specifically on local or national data, and then linking these interventions to a policy review, including economic policies, is an important next step.

The assessment will allow users to identify both instruments and interventions that can be tailored to national contexts, which then provides a basis for mapping the existing policies to interventions that will provide the most improvement in the shortest time. The aim is to have a reduction of plastic flowing into the ocean, and a reduction in plastic stock in the environment.

Innovative solutions require tackling problems from new angles. The relevance of the IUCN Close the Plastic Tap programme, and the approaches shared in this publication, is clear. IUCN has provided tools, methodologies, strong research results, and several examples that demonstrate how to identify and remove plastics, and prevent them from polluting our planet.

The IUCN comprehensive approach shows that there is no simple solution to solve the global crisis of plastic pollution. The complexity of interlinked drivers and impacts related to plastic pollution uncovered by IUCN's research shows that targeted actions are needed – at several levels and from a variety of stakeholders – to stem the flow of plastic into the environment.

**From plastic production to consumption to waste to circular economy, plastics need a rethink. Science-based decision making, with comprehensive plastic pollution strategies, as presented here, is urgently needed to help to close the plastic tap to restore the health of the global ocean.**

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# Annex A: Methodologies

## Guidance for plastic pollution hotspotting

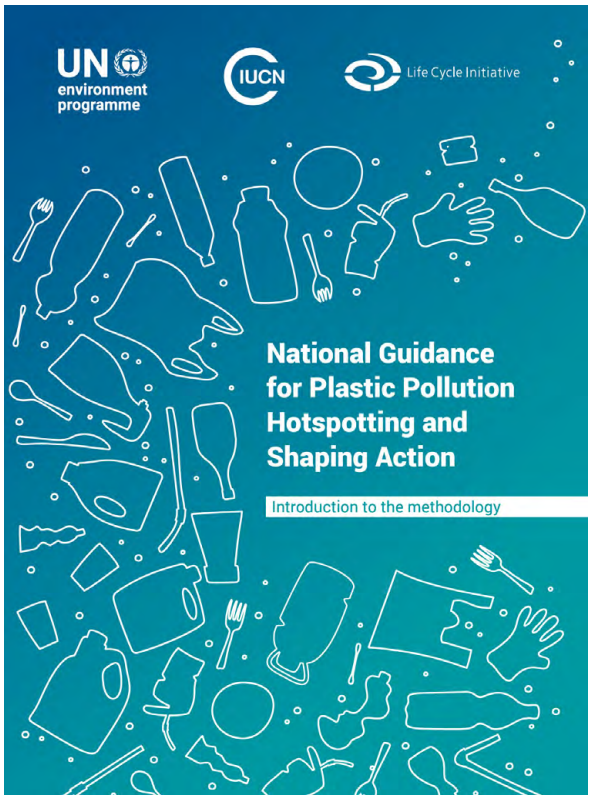


Figure A1. Cover of the UNEP/IUCN *National Guidance for Plastic Pollution Hotspotting and Shaping Action, Introduction to the methodology*.

Co-developed by the United Nations Environment Programme (UNEP), the Life Cycle Initiative, and IUCN, the *National Guidance for Plastic Pollution Hotspotting and Shaping Action, Introduction to the methodology*[10] fills an important knowledge gap.

Available in English, Spanish, and Portuguese, it provides a comprehensive framework and practical tools to perform a subnational or national level hotspotting assessment. Since 2020, a number of other methodologies have been developed and this is a growing field – currently it is estimated that there are 34 active methodologies for plastic pollution hotspotting. The Guidance allows users to choose the appropriate scope (national or subnational), tool, and methodology for the purpose of the assessment.

To understand more about the Guidance, modules, and data collection, and to assist with performing assessments, IUCN and UNEP have developed a set of webinars[11] and in-depth training modules and tutorials that are available online and open to all.

10 Available here: https://plastichotspotting.lifecycleinitiative.org/

11 Introductory webinars and tutorial videos are presented are available at: https://plastichotspotting.lifecycleinitiative.org/webinars/

## Policy research methods

Each of the policy documents that the IUCN Close the Plastic Tap programme has generated began with a general assessment at the national level, and then focused on specific issues to identify gaps and produce documents to facilitate the exchange of best practices.

In 2020–2021, IUCN published seven scoping assessments: *The Legal, Policy and Institutional Frameworks Governing Marine Plastics* for Kenya, Menorca (Spain), Mozambique, Republic of Cyprus, South Africa, Thailand, and Viet Nam. Each report[12] was conducted by a locally based national consultant who was an expert in their field, and validated in national workshops. The approaches taken for the scoping studies were intended to generate synopses of the policy landscapes to present to policy makers in conjunction with the hotspotting reports, to link those two components together, and to create a dialogue for action. This work was done through validation workshops and webinars, as well as through ongoing stakeholder engagement in each location.

In the policy assessments for the Republic of Cyprus and Menorca (Spain), the primary methods chosen for collecting policy data were a literature review and the use of a qualitative questionnaire. IUCN sent the questionnaire to implementing partners, who subsequently circulated it among their national networks to reach the experts working on the topic in government agencies and non-governmental organisations.

**Table A1.** Policy questionnaire for assessing plastic pollution in Menorca (Spain) and the Republic of Cyprus.[13]

| Target | Plastic value chain | Sectors | Clean-up measures | Opinion 1 | Opinion 2 |
|---|---|---|---|---|---|
| Is there any target at the national level that specifically addresses plastic pollution? | Are there legal instruments at national level that specifically address plastic waste across the plastic value chain? | Are there additional legal tools in place at national level to tackle plastic pollution in the tourism and fisheries sectors? | Is there any remedial measure at national level that directly addresses plastic waste already polluting the marine and coastal environment? | In your opinion, what are the most appropriate legal tools to tackle plastic pollution? | How could the institutional and legal framework be improved to ensure the proper implementation of such tools? |

The IUCN *Policy Effectiveness Assessment of Selected Tools for Addressing Marine Plastic Pollution: Extended Producer Responsibility* reports for Kenya, Mozambique, South Africa, Thailand, and Viet Nam followed consultations with key institutional, industry, and civil society stakeholders to prioritise legal and policy tools for addressing plastic pollution in each of the five countries. The assessments contribute to measuring the impact of regulatory mechanisms in place and in development for tackling marine plastic pollution.

12 The policy reports for Kenya, Mozambique, South Africa, Thailand and Viet Nam are available here: https://www.iucn.org/theme/environmental-law/our-work/oceans-and-coasts/marine-plastics

13 The policy reports for Menorca, Spain and the Republic of Cyprus are available here: https://www.iucn.org/regions/mediterranean/projects/current-projects/plastic-waste-free-islands-med-project

## Methodologies for economic research

The economic research methodologies varied based on the locations and the topics covered. The concepts were scoped to be complementary to the plastic pollution hotspotting report results. Each economic brief assesses the costs and benefits of current plastic flows, and models costs and benefits of potential future scenarios. The reports are available on the IUCN *Close the Plastic Tap* reports[14] page.

**Table A2.** Methodology summaries for the IUCN economic briefs

| Publication title | Methodology |
|---|---|
| *Economic Assessment of a Deposit Refund System (DRS), an Instrument For The Implementation of a Plastics Circular Economy In Menorca* (2021) | The focus of the evaluation is a deposit refund system (DRS) for PET beverage bottles. A cost-benefit analysis (CBA) was carried out to identify whether the implementation of the instrument would be economically feasible and sustainable over time to support the decision-making process for the government of Menorca. |
| *Marine Plastics, fisheries, and livelihoods in Mozambique* (2021) | Demonstrates the economic methods to show the impacts of plastic pollution on fisheries, employment, food security, export revenue, and marine ecosystems and biodiversity and provides guidance on reducing plastic leakage and its impacts. |
| *Efficiency of beach clean-ups and deposit refund schemes (DRS) to avoid damages from plastic pollution on the tourism sector in Cape Town, South Africa* (2021) | To demonstrate the impacts of plastic pollution on tourism revenue and tourism employment and explain the efficiency of beach cleaning combined with the implementation of a deposit refund scheme (DRS), and share the impact on employment after DRS implementation. |

14 Available here: https://www.iucn.org/theme/marine-and-polar/our-work/close-plastic-tap-programme/reports

# Annex B: Publications of the IUCN Close the Plastic Tap programme

This table provides a list of related project publications that are meant to guide national and subnational actors in their identification, planning and mitigation for marine plastic pollution challenges.

**Table B1.** IUCN publications on plastic pollution from the Close the Plastic Tap programme.

| Title | Scope |
|---|---|
| *National Guidance for Plastic Pollution Hotspotting and Shaping Action: Introduction to the methodology* (UNEP, 2020) | Provide a structure for the methods of identifying plastic leakage hotspots, finding their impacts along the entire plastic value chain, and then prioritising actions once these hotspots are identified. |
| *National Guidance for Plastic Pollution Hotspotting and Shaping Action pilot reports* (2020–2021) | Demonstrate results of using the methodology introduced in the National Guidance above and to identify the polymer, sector, application, geographic, and waste management hotspots in Kenya, Mozambique, Republic of Cyprus, South Africa, Menorca (Spain), United Republic of Tanzania, Thailand, Viet Nam. To provide actionable hotspots, instruments, and priority interventions for action. |
| *Plastic Pollution Hotspotting and Shaping Action Regional Results from Eastern and Southern Africa, the Mediterranean, and Southeast Asia - Regional Report* (2021) | Provide a comparative overview of plastic leakage; an exploration of regional recycling capacity; a showcase of hotspots by archetype, polymer, application, and sector; and a range of potential instruments and interventions for consideration by decision makers to address plastic pollution. |
| *The Marine Plastic Footprint* (2020) | Introduce measures to understand and calculate the leakage of plastic into the marine environment, by following its movement through every stage from production to waste to final destination. |
| *The Mediterranean: Mare Plasticum* (2020) | Demonstrate that an estimated 229,000 t of plastic leaks into the Mediterranean Sea every year, equivalent to over 500 shipping containers each day. Unless significant measures are taken to address mismanaged waste, the main source of the leakage, this will at least double by 2040. |
| *Plasticus Mare Balticum* (2020) | Compile five reports on the Baltic Sea, the countries that border it, the plastics flowing into it, and the lives affected by plastic pollution. It demonstrates the harmful effects of plastic pollution, provides analysis of existing legislation and regulation to curb the effects of plastics, and shares an analysis of business' responses. |
| *Review of Plastic Footprint Methodologies* (2019) | Lay the foundation for the development of a standardised plastic footprint measurement tool. |
| *Solutions to Plastics in the Ocean - the Baltic and Beyond* (2019) | Document a symposium, arranged by the Royal Swedish Academy of Sciences' Environment and Energy Committee and IUCN, on the exchange of knowledge about microplastics in marine environments including distribution, degradation and toxicity, assessments, and risk management. |

| | |
|---|---|
| Primary Microplastics in the Oceans: A Global Evaluation of Sources[13] (2017) | Share the global estimate and mapping of the sources and quantities of primary microplastics in the ocean. It concluded that very small particles washed off synthetic clothing and car tyres are the two main contributors of microplastics going into the ocean. |
| Plastic debris in the ocean: The Characterization of Marine Plastics and their Environmental Impacts, Situation Analysis Report[14] (2014) | Provide a comprehensive overview of the current state of knowledge of the effects of plastics on marine environments, organisms, and ecosystems. This report attempted to identify policy options for solutions. |


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