

Information Document for the preparation of guidelines to tackle single-use plastic items in the Mediterranean.

Report for SCP/RAC

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This report serves as Information Document in the process of development regional guidelines to tackle single-use plastic items in the Mediterranean region, led by SCP/RAC, following the request of the Contracting Parties to the Barcelona Convention and as indicated in the MAP Programme of Work 2020-2021.

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Key abbreviations

BAU: Business As Usual

DRS: Deposit Refund System

EPR scheme: Extended Producer Responsibility scheme

FTE: Full Time Equivalent

MAP: Mediterranean Action Plan

mtpa: Million Tonnes Per Annum

MUs: multi-use products/items/packaging

MRF: Material Recovery Facility

PRO: Producer Responsibility Organisation

SCP/RAC: Regional Activity Centre for Sustainable Consumption and Production

SUPs: single-use plastic products/items/packaging

SUNPs: single-use non-plastic products/items/packaging

Executive Summary

Overall, plastics are estimated to account for around 95% of the waste in the open sea, on the seabed and on beaches across the Mediterranean. In the Mediterranean, it is estimated an annual plastic leakage of 229,000 tonnes, made up of 94% macroplastics and 6% microplastics.¹ As requested by the contracting parties of the Barcelona Convention, the MAP programme² includes activities related to the preparation of guidelines on measures to reduce/prevent the negative impacts associated with single-use plastic items (SUPs), other than plastic bags³, in the Mediterranean region. The purpose of this information document is to support the development of these policy guidelines, by presenting information on the consumption, end of life management and impacts associated with selected SUP items across the Mediterranean region at present and illustrating the potential effects of different policy measures to reduce these impacts in the Mediterranean context.

The research and analysis presented in this report focuses on key SUPs in four Mediterranean countries, namely: beverage bottles, inc. caps and lids; food containers (bowls, clamshells, trays); straws; and cigarette filters in Egypt, Morocco, Montenegro and Greece.

The method used for the development of this information document involved:

- a **rationale for the selection** of countries and selection of SUP items;
- the **development of guidance** on research and data collection for the national experts in Egypt, Greece, Montenegro and Morocco;
- the **identification of a baseline** for the selected SUP items in the four countries, on the basis of the information gathered by the national experts (production, consumption, waste management situation)
- The **development of potential policy measures** to reduce/prevent SUP pollution and an appraisal of their **environmental and socioeconomic impacts** relative to the business-as-usual scenario. The analysis utilised a model previously developed by Eunomia for DG Environment, European Commission.

The design of policy measures to eliminate or reduce the consumption of problematic single use plastics must, inter alia, take into account the necessity for the item in question, and, where relevant, the availability of alternative products and systems to

¹ IUCN (2020) The Mediterranean: Mare Plasticum, <https://portals.iucn.org/library/node/49124>

² In December 2019, at the 21st meeting of the contracting parties to the Convention, the MAP programme of work for 2020-2021 was adopted

³ In the previous biennium, policy guidelines on single-use plastic bags were elaborated and adopted at COP21 of the Barcelona Convention. The document is available here: <http://www.cprac.org/ca/arxiu-de-noticies/generiques/guidelines-to-phase-out-single-use-plastic-bags-in-the-mediterranean-ad>

switch to. For example, where alternatives are widely available and accessible, a ban, or charge on the SUP item is likely to be suitable.

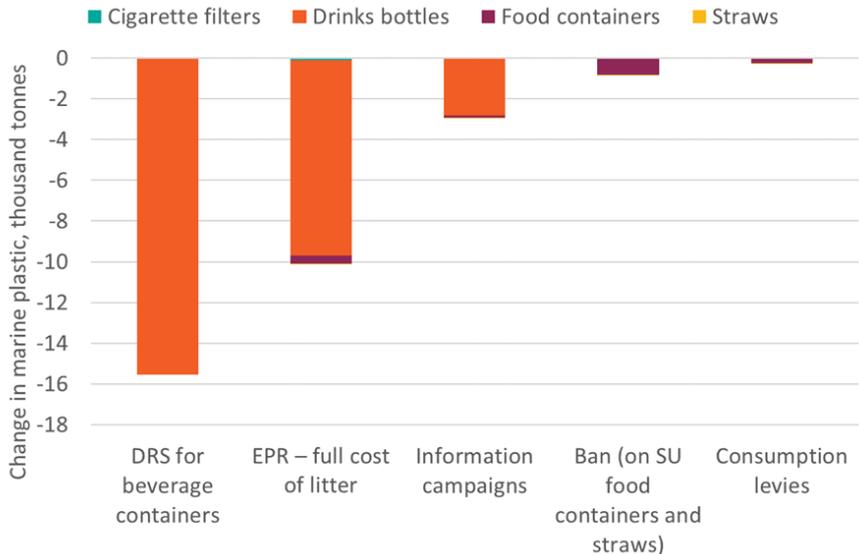
The main types of alternatives available for consideration include single use, non-plastic alternatives (SUNPs), as well as multi-use alternatives (MUs). It is noted that “biodegradable” plastic, or “bioplastic” alternatives, including bio-based plastics and compostable plastics are not considered credible alternatives for single use plastics at present. This is due to widespread misconceptions regarding the options for their end of life treatment, which in reality, are limited and present no added benefit relative to SUPs, except in very few applications. Further, it is noted that between SUNPs and MUs, only the use of MUs will result in the reduction of litter in the marine and terrestrial environment.

Through a long list of policy measures presented in the main report the following list was selected to model, using the following criteria: scale effect (high or low), strength of market demand; the size of the market:

- Information campaigns
- EPR - full cost of litter clean up to be covered by producers
- DRS for beverage containers
- Consumption levies - predominantly for food packaging
- Bans

Firstly, the changes in plastic litter reaching the marine environment (in weight-based i.e. tonnage terms) are presented below. This figure clearly shows that, in terms of tonnage, Deposit Refund Schemes lead to the greatest reduction in (littered) marine plastics reaching the environment, in the order of 16 thousand tonnes. EPR schemes for litter, which are assumed to lead to a 50% increase in litter collection by 2030, are modelled to reduce marine littering by c. 10 thousand tonnes. The combined impact of DRS and EPR (c. 26 thousand tonnes), is equivalent to preventing the leakage of approximately 1,700 truck-loads of plastic waste per year (more than 4.5 trucks per day) into the environment.⁴

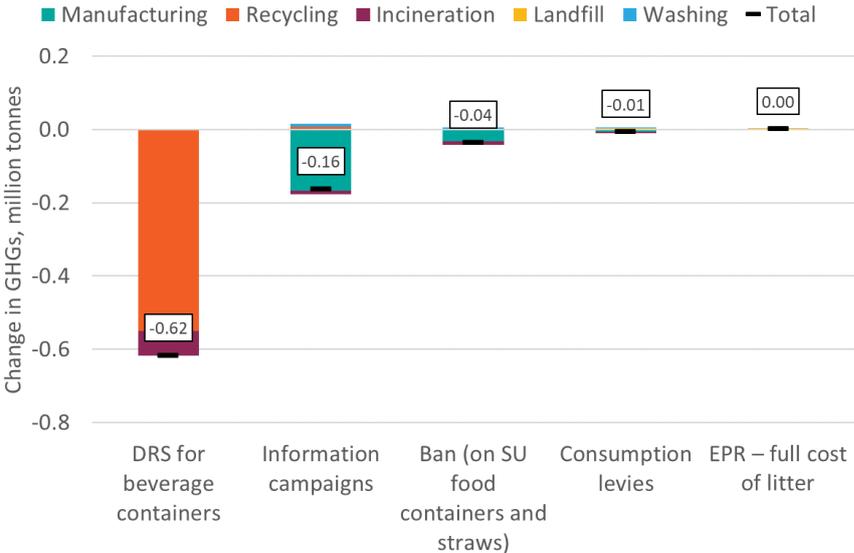
Figure: Change in Marine Plastic Litter, Thousand Tonnes (2030)



The modelled change in greenhouse gas emissions for the major sources of emissions throughout the product lifecycle are shown in the Figure below. In terms of greenhouse gas emissions, DRS schemes show the greatest environmental benefit, of approximately 0.6 million tonnes of CO₂ equivalent prevented each year. This is due to the carbon benefits of a significant increase in recycling of beverage containers, with a further contribution from a reduction in plastic sent to incineration. This emissions saving is equivalent to the emissions produced by approximately 240 thousand citizens (equivalent to 0.16% of the total population of the four countries modelled).⁵

⁴ Based on 15 tonnes per truck-load: Royal Society Te Apārangi (2019) *Plastics in the Environment*
⁵ Based on emissions of 2.57 tonnes CO₂e per year (data for Greece, Egypt, Montenegro and Morocco, weighted by population): Worldbank (2019) *CO2 emissions (metric tons per capita)*, <https://data.worldbank.org/indicator/EN.ATM.CO2E.PC?locations=EG-ME-GR-MA>

Figure: Change in Greenhouse Gas Emissions, Million Tonnes CO2e (2030)



Concerning the economic impacts of the measures modelled, measures targeting consumption of SUP products (bans and consumption levies) can lead to either an increase or loss in sales, depending on the type of product that consumption is switched to. All measures lead to a loss for producers of plastic products, and net gains are only made by producers where the increased turnover for producers of alternative products is greater than this lost revenue. Producer fees for EPR schemes for litter are approximately €121 million, and €185 million for a DRS scheme (assuming a 1 Euro cent producer fee).

DRS schemes have the most significant positive impact on employment, with an estimated 11.5 thousand jobs (FTE) created. Over half these jobs are associated with the running of the scheme, including collections of DRS material, additional staff required by retailers (who are effectively reimbursed through handling fees), haulage, administration and counting centres. Significant jobs are also created through the additional requirements for plastic reprocessing capacity, which could be both at newly constructed domestic recycling facilities or abroad if material is exported. Approximately 3.3 thousand net jobs are created through bans on single use food container and straws. This is due to the implementation of refillable take-away box schemes for food containers, as they require reasonably significant numbers of staff to operate them, in relation to collection and washing. This increase in jobs significantly offsets reductions in manufacturing jobs due to decreased net consumption.

The overall recommendations to consider for the policy guidelines, cover: improving waste collection/ separation – particularly along coastal areas and waterways; the use of bans and levies of SUP product to maximise effect; ensuring implementation of DRS for beverage containers to support increased recycling rates, reduced littering of deposit-bearing containers, a reliable supply of high-quality recycled material, reduced greenhouse gas emissions and air pollutants; and increased employment.

In addition, recommendations include supporting the implementation of Nationwide Potable Water/ Refill Systems, via installation of fully functioning and properly maintained potable water supply systems that provide a reliable and clean supply of water. Finally, improving data availability and data collection is recommended, via the development of a national packaging registry focussed on gathering the evidence required to monitor and enforce compliance, as well as maximising sorting of plastics from residual waste prior to landfill / recovery.

1.0 Introduction

Marine plastic pollution poses a serious threat to the aquatic environment and to human health across the world. As the issue has risen up the global political agenda, there have been increasing calls for action in the Mediterranean. The Mediterranean Sea has one of the highest concentrations of floating plastics in the world.⁶ As an enclosed basin with a dense coastal population and strong tourism and maritime industries, the problem of marine litter is particularly acute. Preventing plastic pollution in coastal countries of the Mediterranean is therefore of utmost importance.

A number of EU and regional regulatory frameworks have sought to address the situation. Established in 1975, under the Regional Seas Programme of the United Nations Environment Programme (UNEP), the Mediterranean Action Plan (MAP) provides the institutional framework for addressing marine environmental challenges in the region. Following UNEP/MAP, the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) was adopted to prevent pollution and to protect the marine environment of the Mediterranean. The Convention is composed of 22 Mediterranean countries and the European Union.

In December 2019, at the 21st meeting of the contracting parties to the Convention, the MAP programme of work for 2020-2021 was adopted.⁷ As requested by the contracting parties, the programme includes activities related to the preparation of guidelines on measures to reduce/prevent the negative impacts associated with single-use plastic items (SUPs), other than plastic bags⁸, in the Mediterranean region. The purpose of this information document is to support the development of these policy guidelines, by presenting information on the consumption, end of life management and impacts associated with SUP items across the Mediterranean region at present and illustrating the potential effects of different policy measures to reduce these impacts in the Mediterranean context.

A key element of the assignment was also to raise awareness of, and technical capacity to implement, policies to address SUP pollution within the contracting parties of the Barcelona Convention. This will be also done via the regional training (webinars) scheduled in January and February 2021 that will then feed into the guidelines. The elaboration of the guidelines will be led by SCP/RAC, following the request of the

⁶ UNEP/MAP (2017). 2017 Mediterranean Quality Status Report.

https://www.medqsr.org/sites/default/files/inline-files/2017MedQSR_Online_0.pdf

⁷ UNEP (2020) *UNEP proposed programme of work and budget for the biennium 2020–2021*, accessed 11 September 2020, <http://www.unenvironment.org/resources/medium-term-strategies/unep-proposed-programme-work-and-budget-biennium-2020-2021>

⁸ In the previous biennium, policy guidelines on single-use plastic bags were elaborated and adopted at COP21 of the Barcelona Convention. The document is available here: <http://www.cprac.org/ca/arxiu-de-noticies/generiques/guidelines-to-phase-out-single-use-plastic-bags-in-the-mediterranean-ad>

Contracting Parties to the Barcelona Convention and as indicated in the MAP PoW 2020-2021. The regional training on SUP will be organised in the framework of the EU-funded WES project.

1.1 Report Structure

This report is structured as follows:

- Regional Context: an overview of the SUP problem in the Mediterranean (Section 2.0);
- Methodology (Section 3.0):
 - Overarching approach;
 - Country selection;
 - SUP item selection;
- Baseline situation for representative countries (Section 4.0):
 - Current production and use of SUPs;
 - Current SUP waste management practices and policy;
 - Current SUP policies;
- Impact assessment of policy measures (Section 5.0):
 - Availability of alternative solutions and business models
 - Selection of policy measures;
 - Modelled impacts; and
- Recommendations for policy guidelines (Section 8.0).

2.0 Regional Context

2.1.1 Extent and Nature of SUP Pollution in the Mediterranean

According to the EU definition⁹ a ‘single-use plastic product’ means a product that is made wholly or partly from plastic and that is not conceived, designed or placed on the market to accomplish, within its life span, multiple trips or rotations by being returned to a producer for refill or re-used for the same purpose for which it was conceived;

It is now internationally recognised that marine litter in the Mediterranean is a critical issue. Indeed, the Mediterranean Sea has one of the highest concentrations of floating

⁹ DIRECTIVE (EU) 2019/904 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 June 2019 on the reduction of the impact of certain plastic products on the environment, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0904>

plastics in the world.¹⁰ Not only does marine plastic pollution threaten aquatic ecosystems, but it is costly for the industries which depend upon the marine environment. This section provides an overview of the scale of this problem, the key factors contributing to such high levels of marine plastic pollution and an outline of the waste management context across the region.

In a sea which covers less than 1% of the world's oceans, but accounts for around 10% of the world's biodiversity, the Mediterranean is now estimated to hold up to 55% of all floating ocean plastic particles and concentrates 7% of all global microplastics.^{11 12 13} It is estimated that 0.57 million tonnes of plastic waste enter the Mediterranean every year, a figure which is expected to rise. Marine plastic litter is deposited on the sea bed and beaches, with around 5.1kg of plastic waste accumulating along each kilometre of Mediterranean coastline every day.¹⁴ Overall, plastics are estimated to account for around 95% of the waste in the open sea, on the seabed and on beaches across the Mediterranean.¹⁵ In the Mediterranean, it is estimated an annual plastic leakage of 229,000 tonnes, made up of 94% macroplastics and 6% microplastics.¹⁶ This poses a major threat to marine biodiversity and the ecosystems within the marine environment, thereby threatening key economic sectors (such as fisheries and tourism), as well as negatively impacting air and water quality, and ultimately, human health.

In terms of the types of plastic pollution found in the Mediterranean Sea, certain items are more prevalent in marine litter than others. Data from the Joint Research Centre (JRC) in 2016 for instance, identifies the top 15 beach litter items for the Mediterranean Sea and their share and average frequency per 100m coastline. As shown in Table 1 Top 10 beach litter items for the Mediterranean Sea, based on 33 OSPAR screenings, plastic items, particularly single-use products, are ubiquitous.¹⁷

¹⁰ European Commission (2019) *New tool to track plastic pollution in the Mediterranean Sea*, accessed 11 August 2020, <https://ec.europa.eu/jrc/en/science-update/new-tool-track-plastic-pollution-mediterranean-sea>

¹¹ European Commission (2019) *New tool to track plastic pollution in the Mediterranean Sea*, accessed 11 August 2020, <https://ec.europa.eu/jrc/en/science-update/new-tool-track-plastic-pollution-mediterranean-sea>

¹² UNEP/ MAP -SCP/ RAC (2010), *The Mediterranean Sea Biodiversity: state of the ecosystems, pressures, impacts and future priorities*, https://www.rac-spa.org/sites/default/files/doc_cop/biodiversity.pdf

¹³ Suaria, G., Avio, C.G., Mineo, A., et al. (2016) The Mediterranean Plastic Soup: synthetic polymers in Mediterranean surface waters, *Scientific Reports*, Vol.6, No.1, p.37551

¹⁴ Liubartseva, S., Coppini, G., Lecci, R., and Clementi, E. (2018) Tracking plastics in the Mediterranean: 2D Lagrangian model, *Marine Pollution Bulletin*, Vol.129, No.1, pp.151–162

¹⁵ UNEP/MAP (2015) Marine Litter assessment in the Mediterranean. Available at <https://wedocs.unep.org/rest/bitstreams/9739/retrieve>

¹⁶ IUCN (2020) *The Mediterranean: Mare Plasticum*, <https://portals.iucn.org/library/node/49124>

¹⁷ Hanke, G. (2016) *Marine Beach Litter in Europe – Top Items*, 2016, https://mcc.jrc.ec.europa.eu/documents/Marine_Litter/MarineLitterTOPitems_final_24.1.2017.pdf

It is worth noting that lost and abandoned fishing gear also contribute to marine plastic pollution in the Mediterranean, although data on the issue is limited.¹⁸

Table 1 Top 10 beach litter items for the Mediterranean Sea, based on 33 OSPAR screenings

Item	Average number per 100m	Share
Cutlery/trays/straws (total)	131	17%
Cigarette butts	112	14%
Caps/lids (total)	110	14%
Drink bottles (total)	91	12%
Bags (e.g. shopping)	43	5%
Cotton bud sticks	37	5%
Bags	35	4%
Plastic/polystyrene pieces 2.5 cm > < 50cm (total)	30	4%
Bottles	28	4%
Crisp/sweet packets and lolly sticks (total)	26	3%

Source: Hanke, G. (2016) *Marine Beach Litter in Europe – Top Items, 2016*,

Similarly, more recent data on the Top-X marine litter items indicates the prevalence of cigarette butts, plastic caps and lids and drink bottles (shown in Table).

Table 2 Mediterranean Top-X Marine Litter Items, 2019

Item Description	Top-X Score
Plastic/polystyrene pieces 2.5cm >< 50cm	36
Cigarette butts and filters	32

¹⁸ UNEP/MAP (2015) Marine Litter assessment in the Mediterranean. Available at <https://wedocs.unep.org/rest/bitstreams/9739/retrieve>

Plastic caps and lids (including rings from bottle caps/lids)	32
Drink bottles	22
Other plastic/polystyrene items (identifiable) including fragments	18
Crisp/sweet packets and lolly sticks	7
Cotton bud sticks	7
String and cord (diameter <1cm)	6
Glass fragments > 2.5cm	2
Glass bottles (including identifiable fragments)	2

Source: UNEP/MAP 2019. *Marine Litter Assessment: Updated Baseline Values and Threshold Values for IMAP Marine Litter Indicators. Regional Meeting on Pilot Projects and Assessment Tools for Marine Litter. UNEP/MED WG.476/3*

Both these data sets indicate that SUPs in particular, rather than plastic more generally, tend to be the most frequently occurring beach litter items. For instance, there is a predominance of land-based/coastal recreational sources of SUP litter, as opposed to ocean-based sources of plastic litter from fishing or shipping activities. Although it should be noted that with 30% of global shipping traffic, marine plastic pollution from lost or dumped fishing gear is not insignificant in the basin.¹⁹ The sources of SUP marine litter are discussed further in the following section.

Apart from macroplastics, microplastics are a significant source of pollution along the Mediterranean coastlines, there are currently no policy measures in place to tackle the issue, and national research into the sources, types and pathways of such pollution is limited. Although some microplastics e.g. microbeads in cosmetics can be considered as single-use, they are not included in the scope of this report, neither in the SUPs guidelines process. Microplastics shall be covered by a specific regional process in the future.

2.1.2 Sources and Pathways of Marine Plastic Pollution

There are two primary sources of marine plastic pollution: plastic waste entering the sea indirectly from terrestrial based activities, or directly from coastal and sea-based activities. Studies have shown that generally, 80% of litter entering the marine

¹⁹ Campana, I., Angeletti, D., Crosti, R., Luperini, C., Ruvolo, A., Alessandrini, A., and Arcangeli, A. (2017) Seasonal characterisation of maritime traffic and the relationship with cetacean presence in the Western Mediterranean Sea, *Marine Pollution Bulletin*, Vol.115, Nos.1–2, pp.282–291

environment is from land-based sources, and 20% from ocean-based sources. Several factors combine to make the Mediterranean a hotspot for both sources of litter.

2.1.2.1 Land-based Sources and Pathways

Firstly, not only is the region the world's fourth largest plastic producer, but the populations of the Mediterranean basin also produce some of the highest quantities of solid urban waste per capita, at 208-760kg/yr.²⁰ Nearly 24 million tonnes of plastic waste are therefore estimated to be generated every year in the region. Moreover, items found on Mediterranean beaches show a prevalence of land-based litter stemming predominantly from recreational/tourism activities.²¹ Waste that is littered, dumped, or otherwise leaked into the environment in coastal areas is far more likely to reach the marine environment than that leaked further inland. As a result, marine litter on the Mediterranean coast can increase by around 40% during the peak tourist period.²²

Secondly, the effectiveness of waste management varies, both within the EU countries of the Mediterranean and between EU and non-EU countries in the region. The mismanagement of waste remains a key issue across the region, although, it is more of a challenge in some countries compared to others. Crucially, plastic waste which is uncollected, dumped or disposed in uncontrolled/illegal landfills is one of the primary sources of plastic leakage into the Mediterranean. It is suggested that around 6 million tonnes of plastic waste are mismanaged every year in the basin, with southern Mediterranean countries recycling, on average, less than 10% of their plastic waste.²³

Typically, plastic waste which is directly littered or dumped into the environment or which leaks from the waste management system enters rivers, finally ending up in the sea. This includes pathways for waste that is, for example, incorrectly flushed (e.g. wet wipes, tampons, cotton buds) or littered along roadways (e.g. on-the-go food and beverage packaging), thereby entering wastewater and stormwater sewage systems that empty into waterways, or alternatively waste that is collected but subsequently blown or washed out of unmanaged landfills or windswept during transportation, in addition to the more obvious wastes that are illegally dumped, littered and fly-tipped terrestrially. Plastic waste is particularly susceptible to being transported during wind and flood storm events, due to its lightweight, non-biodegradable and durable nature. The Po in Italy, the Seyhan and Ceyhan in Turkey and the Nile in Egypt are amongst a number of large rivers

²⁰ WWF (2018) *Out of the plastic trap: saving the mediterranean from plastic pollution*, accessed 11 August 2020, https://mcc.jrc.ec.europa.eu/documents/Marine_Litter/MarineLitterTOPitems_final_24.1.2017.pdf

²¹ UNEP/MAP (2015) Marine Litter assessment in the Mediterranean. Available at <https://wedocs.unep.org/rest/bitstreams/9739/retrieve>

²² Galgani, F., Barnes, D., Deudero, S., et al. (2014) Marine litter in the Mediterranean and Black Seas - Executive Summary, *Marine Litter in the Mediterranean and Black Seas*. (1 January 2014) Monaco: CIESM Publisher, pp.7–20

²³ WWF (2018) *Out of the plastic trap: saving the mediterranean from plastic pollution*, accessed 11 August 2020, https://mcc.jrc.ec.europa.eu/documents/Marine_Litter/MarineLitterTOPitems_final_24.1.2017.pdf

which feed into the Mediterranean, representing both some of the most valuable coastal ecosystems in the region, but also key pathways for land-based plastic litter to enter the sea.²⁴The problem is exacerbated because the Mediterranean is an enclosed sea. It has a net inflow of surface waters from the Atlantic and an outflow which occurs at depth through the Strait of Gibraltar.²⁵ This is important because disposable packaging tends to be made from lower-density polymers, such as polyethylene and polypropylene, which are less susceptible to sinking.²⁶ Thus, with limited outflow of surface water such plastic materials are more likely to accumulate and travel across the surface of the Mediterranean rather than being deposited on the seabed.

2.1.2.2 Sea-based Sources and Pathways

While not within the scope of this report, the maritime (including touristic cruises) and fishing industries are particularly prominent in the region. There is a lack of data on litter which specifically originates from ships in the Mediterranean Sea. Based on the evaluation that 6 million tonnes of waste enters seas globally from ships, and given that 30% of maritime traffic occurs in the Mediterranean, it is estimated that ships could be responsible for over a million tonnes of waste entering the Mediterranean.²⁷ Such sea-based sources include lost or discarded fishing gear, illegal dumping of waste and loss of cargo. Ultimately, modelling suggests that coastal activities are responsible for half of the plastic entering the Mediterranean Sea.²⁸

2.1.3 Overview of Regional Policy related to SUP Pollution

There are three key legal frameworks and regarding marine litter management in the basin: The Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention), the Union for the Mediterranean (UfM) and the EU. Key instruments in addressing the topic are the Regional Plan on Marine Litter Management in the Mediterranean and the EU Marine Strategy Framework Directive (MSFD) (where applicable). The Barcelona Convention entered into force in 1978 and now has 22 Contracting Parties including the European Union. The main objectives of the Convention include assessing and controlling marine pollution, to protect the marine environment and coastal zones through prevention and reduction of

²⁴ WWF (2018) *STOP THE FLOOD OF PLASTIC: How Mediterranean countries can save their sea*, accessed 11 August 2020, https://www.wwfmmi.org/newsroom/latest_news/?uNewsID=348053

²⁵ UNEP/MAP (2015) *Marine Litter Assessment in The Mediterranean*, accessed 8 March 2017, <https://wedocs.unep.org/rest/bitstreams/9739/retrieve>

²⁶ Suaria, G., Avio, C.G., Mineo, A., et al. (2016) The Mediterranean Plastic Soup: synthetic polymers in Mediterranean surface waters, *Scientific Reports*, Vol.6, No.1, p.37551

²⁷ UNEP/MAP (2015) *Marine Litter Assessment in The Mediterranean*, accessed 8 March 2017, <https://wedocs.unep.org/rest/bitstreams/9739/retrieve>

²⁸ Liubartseva, S., Coppini, G., Lecci, R., and Clementi, E. (2018) Tracking plastics in the Mediterranean: 2D Lagrangian model, *Marine Pollution Bulletin*, Vol.129, No.1, pp.151–162

pollution, and as far as possible, eliminate pollution whether land or sea-based.²⁹ Under the Convention, the Mediterranean Action Plan (MAP) was established. Key MAP priorities include reducing pollution from land-based sources and protecting marine and coastal habitats and threatened species. The Convention has further given rise to several Protocols which prescribe agreed measures and procedures for implementing the Convention. The Protocols address specific aspects of environmental conservation in the Mediterranean, including pollution from sea and land-based sources.³⁰

With regards to EU Mediterranean countries, there are a number of current and proposed EU Directives and action plans which require measures that can help tackle marine litter. This includes revised recycling targets in the Circular Economy Package, the Landfill Directive and the Directive on the reduction of the impact of certain plastic products on the environment (the SUP Directive). However, Member States are at various stages of implementing or meeting these regulations. Table 3 provides a summary of the European policy context in relation to SUP pollution.

Table 3: Summary of EU Policy Context

Policy name	Summary	Relevance
The European Green Deal and Circular Economy Action Plan (launched 2020)	Roadmap for increasing the sustainability of Europe’s economy. Aim to transition the European economy to carbon neutrality by 2050.	The Commission is to propose policies regarding products placed on the EU market, ensuring that they are designed for longer life and recyclability and that they incorporate as much recycled content as possible. Aims to develop the market for secondary raw materials.
Waste Framework Directive (2008/98/EC)	Introduces the waste hierarchy and mandatory recycling targets as well as concepts such as the polluter pays principle and extended producer responsibility.	Member States must meet targets including: 55% of municipal waste prepared for re-use/recycling by 2025, 60% by 2030 and 65% by 2035.

²⁹ European Commission (2020) The Barcelona Convention. *European Commission* https://ec.europa.eu/environment/marine/international-cooperation/regional-sea-conventions/barcelona-convention/index_en.htm

³⁰ UNEP *Barcelona Convention and Protocols*, accessed 20 November 2020, <https://www.unenvironment.org/unepmap/who-we-are/barcelona-convention-and-protocols>

Policy name	Summary	Relevance
Packaging and Packaging Waste Directive (94/62/EC) and (2018/852)	The 2018 revised PPWD contains updated measures to prevent the production of packaging waste, and promote the reuse, recycling and other forms of recovery of packaging waste.	Targets for packaging recycling and establishment of EPR schemes for packaging where they do not currently exist.
Landfill Directive (1999/31/EC)	Aims to prevent or reduce the negative effects of landfilling on the environment and human health.	Specifies uniform standards and requirements such as for landfill location and management, and the characteristics of the waste to be landfilled. A target of max 10% landfill on MSW by 2035 is set. By 2030, Member States must ensure that waste which is suitable for recycling or other recovery is not disposed of in landfills.
Directive on the reduction of the impact of certain plastic products on the environment (2019/904/EC)	Objectives to tackle marine litter, reduce consumption of single use plastic, and to increase separate collection and recycling.	Promoting the increase in the demand for recycled plastics by setting ambitious objectives for recycled content in plastics products. Encouraging the introduction of Deposit Refund Systems (DRS) as one possible method to reach the 90% separate collection target for plastic beverage bottles by 2030. Banning of specific SUP items and identifying alternatives to be introduced. EPR schemes to cover the costs of litter clean-up for specific items. EU Member States have to transpose the Directive by July 2021.
Port Reception Facilities (PRF) Directive (2000/59/EC)	Aims to reduce pollution from ships at sea, including abandoned or lost fishing gear.	Ports are required to provide adequate facilities to collect waste from ships.
Marine Strategy Framework Directive (MSFD) (2008)	Objective to preserve and protect the marine environment, including to reduce litter items entering seas and oceans.	Member States are required to put in place management measures to achieve Good Environmental Status in their marine waters by 2020

2.1.4 Scope of the Study

Across the region, the implementation of measures at the national level to prevent and reduce marine plastic pollution remains problematic, particularly in the non-EU Mediterranean countries. Whilst this study seeks to encompass the 21 Contracting Parties of the Barcelona Convention, therefore, a selection of countries within the Mediterranean are considered in more detail in order to account for various contexts and policy measure impacts. Ultimately, country-level research and a tailored impact assessment were conducted through illustrative national cases. The selection of these focus countries is detailed in section 3.2.

In addition, the policy measures which were analysed relate to a specific selection of SUP items. These particular SUP items are most relevant to the countries in question, although the key SUPs of concern are relatively uniform across the Mediterranean region. The scope of SUPs in this study is outlined in section 3.3.

3.0 Methodology

3.1 Overarching Approach

The research and analysis presented in this report establishes a baseline situation for key SUPs in the Mediterranean region and demonstrates the potential impacts of certain policy measures to reduce/prevent the pollution of these items. The assessment is not comprehensive in terms of the scope of either the SUP items considered, or the policy measures to address them, but rather, is illustrative of the kinds of interventions, and the initial stages of decision-making process, that national governments in the region could use to tackle the problem in the future.

The method used for the development of this information document was structured as follows:

- 1) **Rationale for selected countries and selection of SUP items:**
 - a. The scope of the study involved analysis of four Contracting Parties to the Barcelona Convention, namely: Egypt, Morocco, Montenegro and Greece. The rationale for selecting these countries is detailed in section 3.2;
 - b. A consistent set of four SUP items was analysed across the selected countries in order to enable a comparative assessment of the likely impacts of proposed measures in the different country contexts. Selection criteria were identified through a literature review and drawing on previous experience, with input from the national experts. Criteria included: item prevalence in marine litter, public visibility and availability of data. This is explained in detail in Section 3.3.
- 2) **Development of research approach:** This stage involved developing guidance on research and data collection for the national experts in Egypt, Greece, Montenegro and Morocco. This included a briefing on the approach to modelling and guidance on data gathering techniques such as literature reviews and

stakeholder interviews. Support was provided throughout the research process including a webinar conducted on 1st July 2020, which trained the three national experts to implement the methodology. The webinar focused on the data questionnaire and reporting template developed by Eunomia, providing clear guidance on how to be critical of data and how to make assumptions where data is lacking.

- 3) **Baseline development:** A baseline was identified for the selected SUP items in the four countries, on the basis of the information gathered by the national experts. This was based on the production and consumption of SUPs across the Contracting Parties, as well as existing waste management systems for items of interest, and sets out a business-as-usual scenario (i.e. a projection of the baseline in the future in the absence of further intervention).
- 4) **Impact modelling:** The potential environmental and socioeconomic impacts of policy measures to reduce/prevent SUP pollution were assessed relative to the business-as-usual scenario. The analysis utilised a model previously developed by Eunomia for DG Environment, European Commission. The model included a range of policy measures. Assumptions for changes in consumption, recycling rates and litter reduction due to these measures were based on previous work for DG Environment. The assessment also drew on input from the three national experts, supplemented with a review of international case studies where information on effects and impacts was available.

This information document will support the development of regional guidelines on decision making to tackle SUP pollution in Mediterranean countries and contribute to regional training with key stakeholders to tackle SUP marine litter.³¹ These online training sessions will take place between January and February 2021 with representatives of national governments, the private sector and civil society organisations from the Contracting Parties. One objective of the training is to disseminate the technical expertise and knowledge in this Information Document.

3.2 Selected Countries

This section presents the four countries of focus and the justification for the selection. The following countries in the Mediterranean region were selected as the focus of this study:

- Egypt;
- Greece;
- Montenegro; and
- Morocco.

³¹ The regional training on SUP will be organised in the framework of the EU-funded WES project.

This sample presents a representative typology and geographical scope of the different countries across the Mediterranean, covering: North Africa, the Middle East, the Western Balkans and Southern Europe, including coastal countries and islands. As mentioned earlier, given the role of EU legislation in the development of national policy to tackle SUPs in EU countries of the Mediterranean, focus was instead placed on the southern Mediterranean countries where there is greater potential for additional interventions to tackle the issue. As shown in Table 4, the countries range both in population size, from over 100 million in Egypt to around 600,000 in Montenegro, and in GDP per capita, adjusted for Purchase Power Parity (PPP). PPP-adjusted GDP per capita is a useful indicator of differences in living standards accounting for the relative cost of living between nations. Representation of different population sizes and GDP levels is important as these factors influence SUP consumption levels and waste management systems.

Table 4 Population and GDP of Selected Countries

Country	Population (2019)	GDP per capita, PPP (USD) (2019)
Egypt	100,388,037	12,251
Greece	10,716,322	31,399
Montenegro	622,137	22,989
Morocco	36,471,769	7,826

Source: World Bank (2020)

Furthermore, the four countries are representative of the region in the extent to which they import, domestically produce and export plastic products and waste. Egypt for instance has a rapidly developing petrochemical and plastic industry, with increasing production and export of plastic products and packaging.³² Between 2009 and 2015, Egypt had the second highest plastic production in Africa, after South Africa.³³ Plastic consumption in Egypt is also high. Egypt imports the largest share of polymers and plastics into the African continent, at approx. 18.7% for the time period 1990-2017.³⁴

³² Oxford Business Group (2018) *Egypt sees local production and export growth*, accessed 12 August 2020, <https://oxfordbusinessgroup.com/overview/manufacturing-might-growing-export-activity-and-emphasis-local-production-support-transition>

³³ Babayemi, J.O., Nnorom, I.C., Osibanjo, O., and Weber, R. (2019) Ensuring sustainability in plastics use in Africa: consumption, waste generation, and projections, *Environmental Sciences Europe*, Vol.31, No.1, p.60

³⁴ Babayemi, J.O., Nnorom, I.C., Osibanjo, O., and Weber, R. (2019) Ensuring sustainability in plastics use in Africa: consumption, waste generation, and projections, *Environmental Sciences Europe*, Vol.31, No.1, p.60

In comparison, Morocco has a small plastic manufacturing industry but a high consumption of single-use plastic products. In recent years the amount of plastic, including polymers, imported into Morocco has increased; Morocco is now one of the six largest importers of plastic in Africa.³⁵

One important common trait, is the reliance on the tourism industry in each of these countries, although to differing degrees. In 2017, North Africa and Mediterranean Europe had the highest number of international tourist arrivals globally, reflecting the strength of tourism in the Mediterranean basin.³⁶

As shown in Table , the tourism sector is particularly strong in Montenegro and Greece, contributing nearly a quarter of each country’s GDP.³⁷

Table 5 Contribution of Travel and Tourism to GDP, 2018

Country	Contribution of travel and tourism as a share of GDP, 2018 (%)
Egypt	11.9
Greece	20.6
Montenegro	21.6
Morocco	19.0

Source: Knoema (2019)

Tourism can have a significant impact on the amount of waste generated; tourists can generate, on average, 10-15% more waste per capita than inhabitants.³⁸ Plastic pollution can be particularly high around coastal tourist hotspots. During the peak tourist season in Greece for example, waste generation rises by about 26% with the coastal cities of Thessaloniki, Corfu and Heraklion hotspots for plastic inputs into the sea.³⁹ In Morocco, the total pollution leaked onto Morocco’s Mediterranean coastlines is about 3% of the total Mediterranean coastline pollution. In the tourism hotspots of El Hoceima and

³⁵ Babayemi, J.O., Nnorom, I.C., Osibanjo, O., and Weber, R. (2019) Ensuring sustainability in plastics use in Africa: consumption, waste generation, and projections, *Environmental Sciences Europe*, Vol.31, No.1, p.60

³⁶ (2018) *UNWTO Tourism Highlights: 2018 Edition*, accessed 14 September 2020, <https://www.e-unwto.org/doi/book/10.18111/9789284419876>

³⁷ Knoema (2019) *Contribution of travel and tourism to GDP (% of GDP) by country, 2018*, accessed 11 September 2020, <https://knoema.com//atlas/topics/Tourism/Travel-and-Tourism-Total-Contribution-to-GDP/Contribution-of-travel-and-tourism-to-GDP-percent-of-GDP>

³⁸ UNEP/MAP (2015) *Marine Litter Assessment in The Mediterranean*, accessed 8 March 2017, <https://wedocs.unep.org/rest/bitstreams/9739/retrieve>

³⁹ WWF (2019) *Plastic pollution in Greece: how to stop it. A practical guide for policy makers*, accessed 1 May 2020, http://awsassets.panda.org/downloads/05062019_wwf_greece_guidebook.pdf

Nador, the daily influx of plastic pollution into the Mediterranean Sea per km on these coasts is higher than the Mediterranean average at around 5.6kg/km and 5.1kg/km respectively.⁴⁰

What is more, up to 80% of global marine litter is from land-based sources. Items found on Mediterranean beaches are dominated by land-based litter, mostly from recreational/tourism activities, but household waste is also significant.⁴¹ Not only is the amount of waste generated by a country relevant, but the waste management systems in place are central to addressing the issues and solutions for marine plastic pollution. Waste which is not formally disposed of, or is disposed in uncontrolled or open landfills or is littered, can leak into the surrounding environment. This mismanaged waste is a key source of marine plastic pollution.

Notably, the mismanagement of waste is a challenge in the selected countries, particularly Egypt, Montenegro and Morocco.⁴² The proportion of waste that is inadequately managed in these countries varies depending on the type of waste in question and the state of play in solid waste management infrastructure and policy. Waste that is inadequately managed includes waste that is not collected in formal systems, and is therefore illegally dumped, burned, or disposed of in waterways, including as litter. In addition, waste that is managed in open/ unsanitary landfills or uncontrolled incineration sites is included in these estimates. Waste that is not managed in formal systems is therefore more susceptible to ending up in the wider environment, and, ultimately, as marine pollution.

Estimates of inadequately managed waste in the countries in scope for this study range from a low of ~10% in Greece, to as high as ~65% in Egypt and Morocco, with Montenegro falling somewhere in between at an estimated 30% of inadequately managed waste.⁴³ In Egypt and Morocco in particular, the estimates are a cause for concern, since overall waste generation estimates are similarly high in these countries (~11mtpa in Egypt and ~9mtpa in Morocco compared to ~7mtpa in Greece and only ~0.1mtpa in Montenegro).⁴⁴ The proportion of such waste that is estimated to be plastic in these countries averages around 10%. Overall, these figures suggest that across the four countries studied, as much as 1.35mt of plastic waste each year is not managed formally and potentially ends up as marine pollution, of which ~1.2mt arises in Egypt and

⁴⁰ WWF (2019) *Stop the flood of plastic: a guide for policy-makers in Morocco*, accessed 12 August 2020, http://awsassets.panda.org/downloads/05062019_wwf_marocco_guidebook.pdf

⁴¹ UNEP/MAP (2015) *Marine Litter Assessment in The Mediterranean*, accessed 8 March 2017, <https://wedocs.unep.org/rest/bitstreams/9739/retrieve>

⁴² WWF (2019) *Stop the Flood of Plastic: how Mediterranean countries can save their sea*, accessed 11 August 2020, http://awsassets.panda.org/downloads/a4_plastics_med_web_08june_new.pdf

⁴³ UNEP/MAP (2015) *Marine Litter Assessment in The Mediterranean*, accessed 8 March 2017, <https://wedocs.unep.org/rest/bitstreams/9739/retrieve>

⁴⁴ UNEP/MAP (2015) *Marine Litter Assessment in The Mediterranean*, accessed 8 March 2017, <https://wedocs.unep.org/rest/bitstreams/9739/retrieve>

Morocco alone. Although waste generation rates in Greece overall are similarly high, a lower proportion of mismanaged waste makes this less of an issue. Similarly, although the proportion of mismanaged waste in Montenegro is relatively high, low overall rates of waste generation mitigate against potentially high marine pollution levels. The leakage is estimated at 1,123 tonnes for Montenegro.⁴⁵

It is important to note here, however, that waste generation and disposal statistics in the countries analysed tended to be unreliable as there are no formal weighing facilities at disposal sites, or consistent waste data reporting and measurement methods in place, in addition to wide seasonal fluctuations in waste generation and marine pollution arising due to tourism. Types and quantities of waste vary widely according to location and urban patterns, and the data that does exist relates primarily to waste that is collected in formal management systems (as opposed to uncollected, or informally collected/managed waste). The issue of waste management is discussed further in Section 4.1.5.

Finally, SCP/RAC as a component of UNEP/MAP, has been active in tackling land-based plastic pollution in these regions and has direct experience in these countries. The Centre has provided technical support to Mediterranean countries, the Contracting Parties of the Barcelona Convention, to develop specific regulations and recently elaborated two regional guidelines concerning plastic bags and plastic food and beverage packaging.^{46 47} Considering the growing awareness of marine plastic litter across the globe, these guidelines are likely to be informative beyond the Mediterranean, especially in medium to low income countries.

3.3 Selected SUP Items

In recent years, the EU, one of the Contracting Parties of the Convention, has been particularly proactive in tackling issues associated with single-use plastics. Notably, in June 2019, the EU adopted Directive 2019/904 on the reduction of the impact of certain products on the environment (the SUP Directive). The Directive requires Member States to take certain actions to prevent and reduce marine plastic pollution. The Directive indicates an ambitious policy direction for Europe and provides impetus for the broader region.

Single-use plastic products are defined in the SUP Directive as:

⁴⁵ IUCN (2020) The Mediterranean: Mare Plasticum, <https://portals.iucn.org/library/node/49124>

⁴⁶ SCP/RAC (2019) *Guidelines to address single-use plastics through public procurement in the Mediterranean*, accessed 14 September 2020, <http://www.cprac.org/en/news-archive/general/addressing-plastic-pollution-through-public-procurement-new-guidelines-produced>

⁴⁷ SCP/RAC (2019) *Guidelines to phase out single-use plastic bags in the Mediterranean*, accessed 14 September 2020, <http://www.cprac.org/ca/arxiu-de-noticies/generiques/guidelines-to-phase-out-single-use-plastic-bags-in-the-mediterranean-ad>

*A product that is made wholly or partly from plastic and that is not conceived, designed or placed on the market to accomplish, within its life span, multiple trips or rotations by being returned to a producer for refill or re-used for the same purpose for which it was conceived.*⁴⁸

The following four SUP items are analysed across the selected countries:

- Cigarette filters;
- Beverage bottles, inc. caps and lids;
- Food containers (bowls, clamshells, trays); and
- Straws.

A consistent set of items enabled a comparative assessment of the likely impacts of measures in different country contexts across the Mediterranean. The SUP items were identified through a review of the relevant literature and with attention to the situation in each of the selected countries. Criteria for selection included:

- Prevalence of the item in marine/beach litter in the Mediterranean (as a proxy for the most littered SUP items). This is similar to the approach underpinning the EU SUP Directive, which concerns the most frequent SUP items found in beach litter clean-ups in the EU;
- Visibility of the item in public and political spheres (e.g. subject of existing campaigns, news articles, etc.);
- The relative availability and quality of data on items in the countries of interest. This includes baseline data, consumption trend data, and good case studies on the likely impacts of measures and alternatives; and
- A range of items in terms of their sources, impacts and the potential measures/alternatives that could be applied.

Table 6 presents definitions for the selection of SUP items.

Table 6 Selected SUP Items Definitions

Item	Definition
Cigarette filters	A cigarette filter is a component of a cigarette. The vast majority of littered cigarette filters are single use. Single use cigarette filters can be understood as those designed to capture various chemicals from tobacco use, including tar, which cannot be extracted from the filter. They are the tip of pre-rolled cigarettes, usually made out of cellulose acetate.
Beverage bottles, inc. caps and lids	Single use beverage bottles are most commonly made from PET and HDPE and generally have screw on plastic caps.

⁴⁸ European Commission (2019) Directive (EU) 2019/904 on the reduction of the impact of certain plastic products on the environment

Item	Definition
Food containers	Single use food containers are typically bowls, clamshells and trays. They are used in many applications, such as salad boxes, ready meals, take-aways or cereal packs and are commonly made from polypropylene/expanded polystyrene. They are used to package food for final consumption.
Straws	A single-use plastic straw is a small pipe which allows the consumption of a beverage. Most straws are made from polypropylene and polystyrene.

4.0 Baseline Situation for Representative Countries

4.1 Production and Use of SUPs

This section provides an overview of production and consumption of the four SUP items in each of the selected countries. The availability of data varied both between items and countries; detailed statistical reporting of waste data in the countries in this study is still relatively undeveloped compared to, for example, many EU countries. Wherever possible, data published by local and national authorities has been used, with data from industry or consultant reports used where necessary. This has necessitated the use of carefully considered estimates and assumptions for some data inputs and modelling parameters. These are noted, and wherever possible have been evidenced in reference to known data points. The consumption figures presented in the following tables therefore include estimates and proxies as well as market data. Proxies are marked with an asterisk. The assumptions underpinning consumption estimates and proxies are detailed in section 6.0 and in Table 26 (Appendix A.4.0) sets out the data used for annual consumption of the modelled items in each country. Table 27 shows the year the consumption data in Table 26 relates to.

The consumption data displayed in Table 26 (Appendix A.4.0) was cross examined using the ratios of consumption between the different SUP types for each country. These ratios were then compared between countries so any anomalous values could be flagged. The per capita consumption for each item in each country was also calculated and reviewed.

4.1.1 Greece

Overall, it was estimated that around 0.94 Mt per year of plastic goods are produced in Greece, including all plastic products manufactured using local and imported virgin plastic material. It is estimated that production of PET bottles reached 2,840 million units in 2018 (Global Data estimates). In 2018, 202,100 tonnes of plastic packaging waste was

generated.⁴⁹ In addition, it is estimated that 28.72 billion cigarettes were produced in Greece in 2016,⁵⁰ although imports accounted for a larger market share than domestic cigarettes.⁵¹ More specifically, in 2018 the five big companies ("Papastratos", "Tobacco Industry Karelia", JTI Hellas, BAT Hellas and Imperial Tobacco) recorded a turnover increase of 1.7% reaching 3.71 billion euros. The gross revenues of the five companies amounted to 705.5 million euros, marking a significant increase of 9.5% compared to 2017.⁵²

The data presented in Table 7 was extracted from the model built for the impact assessment of the SUP Directive for the European Commission.⁵³

Table 7 Consumption of SUP Items

SUP Item	Consumption (number of uses, millions)
Cigarette filters	30584
Food containers	132
Straws	1043
Beverage bottles	1412

Source: ICF and Eunomia (2018)

4.1.2 Montenegro

None of the selected SUP items, except for cigarettes, are produced in Montenegro; instead they are imported for consumption. The cigarette production industry is small however, and all products are exported.⁵⁴

There is limited information available on the imports of SUP beverage bottles, this includes imports of both filled and empty bottles. In domestic water production, plastic

⁴⁹ Data obtained from EOAN on 15/07/2020. The data in the above table is based on the information presented in the annual reports of the four (4) EPR schemes (ΕΕΑΑ, ΑΒ ΒΑΣΙΛΟΠΟΥΛΟΣ, ΚΕΠΕΔ, ΑΝΤΑΠΟΔΟΤΙΚΗ ΑΝΑΚΥΚΛΩΣΗ) for 2018, after evaluation and processing of the corresponding adjusted quantities.

⁵⁰ <https://tobaccoatlas.org/country/greece/>

⁵¹ <https://www.researchandmarkets.com/reports/4850652/cigarettes-in-greece-2019>

⁵² <https://www.kathimerini.gr/economy/business/1047970/me-nea-proionta-kai-exagoges-anakamptoyn-oi-kapnoviomichanies/>

⁵³ ICF and Eunomia (2018) *Assessment of measures to reduce marine litter from single use plastics*, Report for DG Environment, May 2018, https://ec.europa.eu/environment/waste/pdf/Study_sups.pdf

⁵⁴ Communication with national expert for Montenegro, October 2020.

bottles are imported as pre-forms and filled in the country. In 2018, it is estimated that around 537 tonnes of PET were used for water packaging in Montenegro.⁵⁵ This is based on data from the Montenegro Company Water Group who produce and package Suza and Rada water in PET bottles. In 2018, the Group used 224 tonnes of PET packaging in water production, representing 41.7% of total water production in the country.⁵⁶ All products of the company are being placed in the Montenegrin market and there is no export to other countries.

Data on the consumption of food containers is based on information provided by three companies importing and distributing food containers: Micromedia, Tring and PG-PAK. In 2019, around 18 million plastic food containers were consumed, including PVC and EPS.⁵⁷ Similarly, data for straw consumption was provided by importer and distributor PG-PAK. PG-PAK reports holding 70% of the HORECA market share in the Capital City of Podgorica and importing over 2.5 million straws in 2019.⁵⁸

Table 8 Consumption of SUP Items

SUP Item	Consumption (number of uses, millions)
Cigarette filters	1313*
Food containers	18
Straws	3*
Beverage bottles	76*

* Data proxies, please see Appendix A.4.0 for further detail.

4.1.3 Egypt

The plastics industry is growing steadily in Egypt.⁵⁹ In 2018, over €3 million worth of plastic materials were imported into the country. In the same year, polymer demand

⁵⁵ Communication with national expert for Montenegro, October 2020. If the company holds a market share of 41.7% and produce 224 tonnes of PET water bottle packaging, then the total production of PET water packaging in the country is in region of 537 tonnes.

⁵⁶ Government of Montenegro, Water Administration (2018), *Information on the implementation of concession agreements in the field of water*, accessible at: https://gov.me/sjednice_vlade_2016

⁵⁷ National expert communication with Micromedia, Tring and PG-PAK, 2020.

⁵⁸ National expert communication with PG-PAK commercial director, 2020.

⁵⁹ Oxford Business Group (2018) *Egypt sees local production and export growth*, accessed 12 August 2020, <https://oxfordbusinessgroup.com/overview/manufacturing-might-growing-export-activity-and-emphasis-local-production-support-transition>

stood at around 2.1 million tonnes.⁶⁰ Trade data indicates that 24,108 tonnes of plastic articles for the conveyance or packaging of goods—including bottles, bags and boxes—were imported.⁶¹

The industries producing the four focus SUP items are concentrated within the industrial areas of Greater Cairo, Alexandria, and Delta governorates. For instance, there are around four preform manufacturers who supply SUP beverage bottles to the majority of bottlers in the country.⁶² Straws are typically imported as finished products however as polystyrene and polypropylene is imported as raw material, it is expected that straws may also be manufactured in smaller quantities. With regards to cigarettes around 85 billion were consumed in 2019, the vast majority of which were manufactured by Eastern Tobacco which held a 72% of the market in 2018.^{63 64}

Table 9 Consumption of SUP Items

SUP Item	Consumption (number of uses, millions)
Cigarette filters	89070
Food containers	3638*
Straws	406*
Beverage bottles	5263

* Data proxies, please see Appendix A.4.0 for further detail.

4.1.4 Morocco

In 2016, a total of 0.71 million tonnes of plastic goods were produced in Morocco, with production driven primarily by the packaging industry.⁶⁵ Much of the raw materials for the plastic industry are imported from the Middle East.

⁶⁰ Egypt Plast (2019) *Market Background*, accessed 19 October 2020, <https://egyptplast.com/market-background/>

⁶¹

ITC (2019) *List of supplying markets for a product imported by Egypt*, accessed 19 November 2020, https://www.trademap.org/Country_SelProductCountry_TS.aspx?nvpm=1%7c818%7c%7c%7c392330%7c%7c%7c6%7c1%7c1%7c1%7c2%7c1%7c2%7c2%7c1%7c1

⁶² Communication with national expert for Egypt, October 2020.

⁶³ Hanafy, K., and Saleh, A.S.E. *The Economics of Tobacco and Tobacco Taxation in Egypt*, p.46

⁶⁴ Eastern Tobacco Company (2019) *Eastern Company: A market leading business in an attractive market*, accessed 19 November 2020, <http://www.easternegypt.com/wp-content/uploads/2019/03/Eastern-Tobacco-Final-IR.pdf>

⁶⁵ WWF (2019) *Stop the flood of plastic: a guide for policy-makers in Morocco*, accessed 12 August 2020, http://awsassets.panda.org/downloads/05062019_wwf_marocco_guidebook.pdf

Cigarette consumption is estimated at 15 billion cigarettes per year, 55% of which are estimated to be imported, mostly from Switzerland and Turkey.^{66 67} In 2016, around 16 billion cigarettes were produced in Morocco.⁶⁸ There was limited data on the number of domestically produced cigarettes which are consumed in country.

Table 10 Consumption of SUP Items

SUP Item	Consumption (number of uses, millions)
Cigarette filters	15000
Food containers	150
Straws	149*
Beverage bottles	1274

* Data proxies, please see Appendix A.4.0 for further detail.

4.1.5 Overview of Consumption per Capita

A comparison of consumption by country is provided in Table 11, and compared to the EU average. As discussed in Section 4.1, model assumptions are based on best available data, this includes, for example, the use of single data sources from data that only represents a proportion of the market, where more robust data is not available. Hence assumptions vary significantly in some cases relative to the European average.

Table 11: Consumption of SUP Items per Capita

	Cigarette filters	Food Containers	Straws	Drinks Bottles
Greece	2854	12	97	132
Egypt	887	4.1	4.0	52
Montenegro	2110	29	4.1	122

⁶⁶ Le Matin (2019) *Le Matin - Marché du tabac : Un secteur méconnu en mal de reconnaissance*, accessed 19 November 2020, <https://lematin.ma/journal/2019/marche-tabac-secteur-meconnu-mal-reconnaissance/328698.html>

⁶⁷ Maglor *Cigarettes sold in Morocco more 'addictive and toxic' than in Europe*, accessed 19 November 2020, <http://www.maglor.fr/maglor/maroc/les-cigarettes-vendues-au-maroc-plus-%C2%ABaddictives-et-toxiques%C2%BB-que-en-europe>

⁶⁸ ABOULFARAJ, Z. (2018) *Maroc : 17 600 personnes meurent à cause du tabac ou des maladies qui en résultent*, accessed 19 November 2020, <https://www.yabiladi.com/articles/details/63731/maroc-personnes-meurent-cause-tabac.html>

	Cigarette filters	Food Containers	Straws	Drinks Bottles
Morocco	411	4.1	4.1	35
EU Average	1,391	52	406	140

4.2 Current SUP Waste Management Practices

4.2.1 Greece

Greece has historically struggled to implement EU environmental law, with waste management featuring prominently in the list of infringement cases that have been brought against the country. Approximately 78.4% of municipal waste is landfilled and there are still 75 active landfill sites across the country. There is continued use of several illegal landfill sites which do not meet the requirements of the landfill Directive, despite the EU Decision (Case C-378/13), which imposed a flat-rate fine and a six-month fine depending on the number of operating and unrehabilitated sites. According to the latest data from the EU, there are still 52 uncontrolled waste disposal sites operating in Greece.⁶⁹ There is a very low rate of source separation of waste and contamination of separately collected materials is a key issue.

According to data reported to Eurostat, Greece recycled around 39.8% of plastic packaging waste in 2018 (compared to about 63.6% recycling across all packaging waste).

In terms of waste treatment, there are currently six mechanical biological treatment (MBT) facilities in operation: four MBTs in Kozani (since 2017), Ioannina (since 2018), Serres (since 2019) and Chania (since 2006 and has been upgraded) and two old MBTs in Athens (since 2007) and Heraklion (Crete, since 2008) that need upgrading. In addition, 17 new MBT units are to be procured by the end of 2020 according to national planning and with a total of 40 plants by 2021. The approved NWMP stipulates that 30 to 38 MBT units will be built by 2023 (in addition to the existing ones) (source: Annex III, NWMP)⁷⁰.

A variety of stakeholders are responsible for waste management in Greece, including the Greek Ministry of Environment and Energy at the national level and the Hellenic Recycling Agency (EOAN) responsible for the approval, monitoring, and control of the

⁶⁹ Ministry of Environment and Energy (MoEE), *Εθνικό Σχέδιο Διαχείρισης Αποβλήτων, 2020 – 2030*: <https://www.e-nomothesia.gr/kat-periballon/apobleta/praxe-upourgikou-sumbouliou-39-tis-31-8-2020.html>

⁷⁰ Ministry of Environment and Energy (MoEE), *Εθνικό Σχέδιο Διαχείρισης Αποβλήτων, 2020 – 2030*: <https://www.e-nomothesia.gr/kat-periballon/apobleta/praxe-upourgikou-sumbouliou-39-tis-31-8-2020.html>

existing operating systems in Greece. Furthermore, the Hellenic Recovery Recycling Cooperation (HERRCO) is the competent authority (Producer Responsibility Organisation) for the design and implementation of recycling policies. Municipalities are also responsible for waste collection and management at the local level.

HERRCO's main activity is the development, funding, and operation of a network of "blue bins" for co-mingled packaging waste, in cooperation with municipalities.⁷¹ In 2003, HERRCO introduced the Blue Bin recycling system for co-mingled packaging waste collection: paper and cardboard, metal, glass and plastic. Between 2011 and 2015 the percentage of the population covered by the blue bin system is reported to have increased from 75% to 92%⁷² and in 2018 the reported coverage figure reached 95%. Over the same period (2011-2015), the number of Material Recovery Facilities (MRF) also increased from 28 to 32 and today there are 44⁷³, 9 of which are operated by HERRCO.

Moreover, the EPR fees producers are obliged to pay (2020) for plastic packaging put on the market (PoM) is 66 EUR /tonne, compared to 52.5 EUR /tonne for paper and card, 21 EUR /tonne for steel, 8.8 EUR/tonne for aluminium and 10.9 EUR/tonne for glass. These are recorded to be the lowest EPR fees in Europe.

In addition to HERRCO, AB Vasilopoulos and Antapodotiki are two other EPR schemes for packaging waste. AB Vasilopoulos is a supermarket chain which has operated recycling centres for own brand products since 2003. Up to seven different materials can be recycled including plastic bottles and plastic containers.

AB VASSILOPOULOS S.A. currently operates at a very small scale whilst Antapodotiki offers a reward scheme for packaging whereby consumers receive €1 with the return of 33 items of packaging waste (which could be aluminium, plastic bottles, or glass).

4.2.2 Montenegro

In Montenegro, the majority of waste is landfilled at either regulated or unregulated sites. In 2018, only 5.5% of municipal waste was recycled, as reported to Eurostat.⁷⁴ In general, waste management infrastructure is underdeveloped. There are two sanitary landfills located in Podgorica and Bar; the former also includes recycling facilities where people can bring their separately sorted waste and the latter serves six coastal

⁷¹ Frantzis, I. et al (2019) Economic instruments to improve waste management in Greece, accessed 11 May 2020

⁷² HERRCO (2017) *Packaging Recycling: A project for all of us*, accessed 11 May 2020, https://www.herrco.gr/wp-content/uploads/2017/10/Annual_EEAA_2015_en.pdf

⁷³ Υπουργείο Περιβάλλοντος και Ενέργειας (2020) *Εθνικό Σχέδιο Διαχείρισης Αποβλήτων 2020 -2030* (IV243), accessed on 14 September 2020.

⁷⁴ Eurostat (2020) *Recycling rate of municipal waste*, accessed 19 October 2020, https://ec.europa.eu/eurostat/databrowser/view/t2020_rt120/default/table?lang=en

municipalities. Around 61% of waste is disposed of in these two landfills.⁷⁵ According to the 2018 Decision to amend the State Waste Management Plan, four waste management centres will be built in Podgorica, Niksic, Bijelo Polje and Bar.⁷⁶ At present, only a composting facility in Kotor has been built and five recycling yards in Podgorica.⁷⁷

Dumping waste in rural areas or unregulated landfills is common. There is no official data on illegal dumpsites however, and it is unclear what proportion of waste is disposed of by such means. The Report on Implementation of the State Waste Management Plan provides some indication that 50,147 tonnes (20%) of waste is landfilled in temporary/unsanitary landfills.⁷⁸ In addition, according to Zero Waste Montenegro, there are over 200 unregulated landfills/dumpsites; it is unclear what proportion of waste is disposed of in these landfills.⁷⁹

While the Ministry of Sustainable Development and Tourism has ultimate control of all waste streams, municipalities are responsible for the development and implementation of waste management policy at the local level. This includes running and managing waste collection and disposal, typically through the establishment of an entity such as a Public Utility Company (PUC). PUCs are owned by a municipality but are legally separate entities who collect waste management fees. Municipalities face a number of challenges however, including lack of administration skills, inefficiency and lack of resources to enforce waste management, as well as low waste management budgets.⁸⁰ Moreover, there is limited collaboration between municipalities.

There is very little door-to-door collection. Mixed waste is generally collected using large on-street containers that serve multiple households. Although the structure of collection is similar across the country, there is an uneven distribution of equipment in PUCs; some companies are over-equipped and others under-equipped. In the vast majority of municipalities there is no door-to-door collection of separated waste/recyclables. The exception is in the Capital of Podgorica where a new two-bin system has been introduced. Correspondence with the national expert however, has indicated that the system is not functioning properly for the following reasons:⁸¹

- Lack of communication with citizens and low recycling awareness: the signs on the bins are considered small and unclear for instance;

⁷⁵ Government of Montenegro, Ministry of sustainable development and tourism (2018) Report on Implementation of State Waste management plan.

⁷⁶ <https://www.gov.me/ResourceManager/FileDownload.aspx?rId=312628&rType=2>

⁷⁷ Communication with national expert for Montenegro, November 2020.

⁷⁸ Government of Montenegro, Ministry of sustainable development and tourism (2018) Report on Implementation of State Waste management plan.

⁷⁹ Zero Waste Montenegro (2020) *Waste Management status in Montenegro*, accessed 19 October 2020, <https://www.zerowastemontenegro.me/waste-management-status-montenegro>

⁸⁰ Communication with the national expert for Montenegro, October 2020.

⁸¹ Communication with the national expert for Montenegro, October 2020.

- The two bins are often mixed at collection, either because waste is not well sorted, or the number of collection trucks are limited or collection staff are not appropriately trained; and
- Lack of enforcement or incentive for householders to separate waste.

A limited number of municipalities offer bring sites/recycling yards where citizens can bring sorted recyclables. According to Zero Waste Montenegro, there are nine recycling yards, six of which are in Podgorica. There are four material sorting facilities located in the coastal areas of Podgorica, Kotor and Herceg Novi, and one in Zabjlak in the north of the country. In some cities and towns, cardboard is collected separately. This occurs mostly in supermarkets and other businesses which use extensive amounts of cardboard and where it is picked up by local waste management companies.

There is no domestic recycling in Montenegro. Materials are sorted at sorting facilities/recycling centres and then exported. According to data provided by Deponija Livade, a waste management company in Podgorica, over 2,000 tonnes of material was exported for recycling in 2019, 66% of which was cardboard. HDPE accounted for 6% and PET for 2%.⁸² However, the recycling centres in Podgorica, Herceg Novi and Kotor do not operate at full capacity and most waste is disposed of at landfill.

With regards to the informal sector, there is limited data on the prevalence of waste collection by the informal sector on a state level. Zero Waste Montenegro notes that a small proportion of waste is collected separately by Roma collectors, mostly high value materials such as metals and cardboard.⁸³

Other challenges for waste management in Montenegro include the mountainous topography of the country, lack of secondary markets for recyclables and local practices of outdoor waste incineration.⁸⁴

4.2.3 Egypt

According to GIZ, around 60% of the waste produced in Egypt is collected, and less than 20% of this is adequately disposed of or recycled.⁸⁵ In rural areas, up to 15% of waste is collected while the informal sector is particularly active in urban areas. In Cairo for instance, 77% of waste is collected, 10% of which is conducted by 96,000 informal waste pickers.⁸⁶ A significant proportion of waste across the country is disposed of in canals, rivers, streets or other open areas.

⁸² Data received directly from Deponija D.O.O by national expert for Montenegro, 2020.

⁸³ Communication with the national expert for Montenegro, October 2020.

⁸⁴ Communication with the national expert for Montenegro, October 2020.

⁸⁵ GIZ *Improving waste management in Egypt*, accessed 19 October 2020, <https://www.giz.de/en/worldwide/22230.html>

⁸⁶ Kaza, S., Yao, L., Bhada-Tata, P., and Van Woerden, F.(2018) *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050*, The World Bank

According to a 2013 report published by the Ministry of State for Environmental Affairs, Egypt has around 168 composting sites, 94 uncontrolled dumpsites, 60 controlled dumpsites and nine landfills.⁸⁷ The incineration capacity for municipal waste is unclear. The formal waste management system is composed of private and public companies responsible for the collection and landfilling of municipal solid waste. Typically, households dispose of waste in street containers— the provision and capacity of which vary across the country.⁸⁸ There is no formal door-to-door collection.

In some areas, these bins are emptied by contracted companies. Depending on the contracted company, this waste either goes to landfill or for further separation (in MBT-like facilities) where valuable materials are extracted, such as aluminium cans and plastic bottles, and organic waste is separated. A study published by GIZ reports that plastics make up 13% of Egypt's solid waste, with organics responsible for 56%.⁸⁹ Furthermore, a number of waste management companies have established their own separation and processing facilities to treat and separate collected waste for further recycling processes. However, there is typically lack of adequate nationwide disposal infrastructure.⁹⁰

Waste which is sent to municipal landfills is scavenged by the informal sector who collect items with value for recycling, including plastics. What is more, in some areas the informal sector control waste collection. In certain neighbourhoods where government contractors are not established for instance, informal collectors carry out door-to-door collection, sometimes on a daily basis for an agreed monthly fee.⁹¹ Some informal collectors further shred valuable materials to increase its value for recyclers.

Ultimately, waste management services vary across the country. In some locations, government contracted companies collect waste and transfer it to landfills or for further separation; in others, the informal sector plays a significant role in waste collection and recycling. There is a lack of data regarding the fate of specific SUP items within both the formal and informal waste systems. Moreover, there is a lack of strategic planning or allocation of responsibilities for waste management, a situation which is compounded by

⁸⁷ Ministry of State for Environmental Affairs (2013) *Annual Report for solid waste management in Egypt 2013*, accessed 30 October 2020, http://cairoclimatetalks.net/sites/default/files/EN%20Annual%20Report%20on%20Waste%20in%20Egypt_2013.pdf

⁸⁸ Communication with the national expert for Egypt, October 2020.

⁸⁹ GIZ (2014) *Country report on the solid waste management in EGYPT*, accessed 30 October 2020, https://www.retech-germany.net/fileadmin/retech/05_mediathek/laenderinformationen/Aegypten_RA_ANG_14_1_Laenderpr_ofile_sweep_net.pdf

⁹⁰ <https://shehatalaw.com/2020/12/10/the-new-waste-management-law-a-new-environmental-frontier-in-egypt/>, accessed 12 December 2020

⁹¹ Communication with the national expert for Egypt, October 2020.

underfinancing.⁹² This has resulted in the inability of municipal authorities to provide reliable and cost-efficient services.⁹³

4.2.4 Morocco

According to a 2019 report by WWF, over 90% of waste is disposed in landfills or dumps, with open dumping and burning the most common method of waste management.⁹⁴ The report further states that in 2008, there were 174 active uncontrolled dump sites in the country, particularly near large cities.

With regards to sanitary landfills, between 2008 and 2016 the proportion of municipal solid waste collected and disposed in sanitary landfills increased from 10% to 53%.⁹⁵ As of 2019, there were 19 sanitary landfills in operation, the majority of which have low capacities of below 100,000 tonnes per year.⁹⁶ The largest are situated in Rabat and Casablanca and have capacities of up to 500,000 tonnes and 1,400,000 tonnes respectively.⁹⁷

Waste collection services vary across the country and are particularly limited in rural areas. In Rabat for instance, a maximum of 90% of waste is collected, whereas in Tangier it is 31%.⁹⁸ Waste is formally managed by municipalities who have contracts with private companies that collect waste from bins and transport it to either a transfer station or a landfill. There are no MRF-like facilities conducting sorting of collected waste, other than two pilot projects initiated in 2014 in Agadir and Beni Mellal for neighbourhoods of 800 households.⁹⁹ The pilots were established through a partnership of municipalities, companies responsible for waste collection and NGOs.

In 2017, around 40,000 tonnes of plastic was recycled, representing a recycling rate of about 7%.¹⁰⁰ PET bottles with their HDPE caps represent 50% to 60% of the plastics

⁹² GIZ *Improving waste management in Egypt*, accessed 19 October 2020, <https://www.giz.de/en/worldwide/22230.html>

⁹³ Ibrahim, M.I.M., and Mohamed, N.A.E.M. (2016) Towards Sustainable Management of Solid Waste in Egypt, *Procedia Environmental Sciences*, Vol.34, pp.336–347

⁹⁴ WWF (2019) *Stop the flood of plastic: a guide for policy-makers in Morocco*, accessed 12 August 2020, http://awsassets.panda.org/downloads/05062019_wwf_marocco_guidebook.pdf

⁹⁵ Kaza, S., Yao, L., Bhada-Tata, P., and Van Woerden, F.(2018) *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050*, The World Bank

⁹⁶ Communication with the national expert for Morocco, October 2020.

⁹⁷ WWF (2019) *Stop the flood of plastic: a guide for policy-makers in Morocco*, accessed 12 August 2020, http://awsassets.panda.org/downloads/05062019_wwf_marocco_guidebook.pdf

⁹⁸ Kaza, S., Yao, L., Bhada-Tata, P., and Van Woerden, F.(2018) *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050*, The World Bank

⁹⁹ CoMun (2020) *Bonnes pratiques de gestion communales*, accessed 19 November 2020, <http://co-mun.net/maroc/les-reseaux-thematiques/remagdu/bonnes-pratiques-gestion-des-dechets>

¹⁰⁰ WWF (2019) *Stop the flood of plastic: a guide for policy-makers in Morocco*, accessed 12 August 2020, http://awsassets.panda.org/downloads/05062019_wwf_marocco_guidebook.pdf

recycled.¹⁰¹ In 2015, the formal plastic recycling sector comprised 10 companies geographically distributed over Tangier, Kénitra, Casablanca, Marrakech, El Jadida and Agadir.¹⁰²

While the plastic recycling sector in Morocco has a limited number of formal actors, the informal sector is strong. According to estimates by the Zero Zbel Association, there may be as many as 34,000 informal waste pickers.¹⁰³ Typically, informal waste pickers collect the most valuable recyclable materials, including glass and plastics, from street bins/containers and on open dumps and sell it to wholesalers who bundle, clean and sort the waste and transport the materials to recycling facilities in their own trucks.¹⁰⁴ The wholesalers are paid according to the weight of materials delivered to the recycling plant.

4.3 Current SUP Policies

4.3.1 Greece

Greece has already transposed relevant EU Directives into national laws. This includes transposition of the Packaging and Packaging Waste Directive and the Waste Framework Directive. In 2015, the National Waste Management Plan (NWMP) and the National Waste Prevention Plan (NWPP) were introduced. The purpose of the recently adopted NWMP 2020-2030, is to outline the policy, strategy and targets for waste management, suggesting appropriate means by which to achieve the targets. These include:

- 10% of municipal waste maximum landfilled by 2030 (5 years earlier than the 2035 deadline of the EU Directive)
- 60% recycling of MSW by 2030
- Closure of all remaining illegal landfills by 2022
- Separate collection of biowaste at national level by 2022
- 30 to 38 MBT units by 2023 (in addition to the existing ones) (source: Annex III, NWMP)

The NWPP meanwhile, aims to promote sustainable consumption and reuse of products, principally through raising awareness of waste prevention. The latest NWPP is currently under revision.

¹⁰¹ WWF (2018) *Out of the plastic trap: saving the mediterranean from plastic pollution*, accessed 11 August 2020,

https://mcc.jrc.ec.europa.eu/documents/Marine_Litter/MarineLitterTOPitems_final_24.1.2017.pdf

¹⁰² Communication with the national expert for Morocco, November 2020.

¹⁰³ Rachid, A. (2020) *Morocco's Plastic Plague: A formal system... with informal connections*, accessed 19 November 2020, <https://ps.boell.org/en/2020/09/29/moroccos-plastic-plague-formal-system-informal-connections>

¹⁰⁴ WWF (2019) *Stop the flood of plastic: a guide for policy-makers in Morocco*, accessed 12 August 2020, http://awsassets.panda.org/downloads/05062019_wwf_marocco_guidebook.pdf

The most relevant EU legislation is the Directive on the reduction of the impact of certain plastic products on the environment (SUP Directive). The objectives of the Directive are to: tackle marine litter, reduce consumption of single use plastic, and to increase separate collection and recycling. The scope of the Directive is based on the top 10 single-use plastic items found on beaches across the EU, which includes all four of the focus items in this study. The implementing act for the Directive is due to be published in Autumn of 2020. The Greek Ministry of Environment and Energy has now published, following adoption at the Greek Parliament, the national legislation on SUP to reflect the requirements of the SUP Directive (EU) 2019/904. The key policy measures are presented in the table below:

Table 12 SUP Policy Measures

Date	SUP Measure
3 rd July 2021	Restrictions on placing on the market (Art. 5): e.g., cutlery (forks, knives, spoons, chopsticks), plates, certain straws, beverage stirrers, food & beverage containers and cups made of expanded polystyrene and products made from oxo-degradable plastic.
3 January 2022	Marking requirements (Art. 7.1): beverage cups will apply a 0.04 EUR + VAT
5 January 2023	Separate Collection (Art 9.1) Implementation of DRS in Greece
3 July 2024	Product requirements (Art. 6.1): e.g., beverage containers with a capacity of up to three liters permitted only if their plastic caps and lids attached to the containers during the products' intended use.
31 December 2024	Extended producer responsibility (Art. 8): other schemes
1 January 2025	Product requirements (Art. 6) Beverage bottles contain at least 25 % recycled plastic, calculated as an average for all PET bottles.
1 January 2025	Separate Collection (Article 9.1) by 2025, of an amount of waste single-use plastic products listed in Part F of the Annex equal to 77 % of such single use plastic products placed on the market in a given year by weight
1 January 2030	Product requirements (Art. 6) Beverage bottles contain at least 30 % (35% for Greece) recycled plastic, calculated as an average for all PET bottles.

4.3.2 Montenegro

In Montenegro, the Law on Waste Management adopted in 2011 and amended in 2016, provides the legal framework for a national waste management system. Under the law, waste management is implemented according to state waste management plans and local waste management plans. All but one of the 23 municipalities have prepared and/or adopted local waste management plans. The same law also states that costs associated with waste should be borne by those generating it (Extended Producer Responsibility) although implementation, and cost recovery, is limited. The new Draft Law on Waste Management to be adopted by the end of 2020 will better define the EPR system and its application.

Furthermore, the government's 2015 State Waste Management Plan for the period 2015-2020, sets out objectives for waste preparation for reuse and recycling. It outlines specific aims in the areas of waste separation, reuse and recycling, and provides for activities relating to the management of municipal waste. Targets set out in the plan include the following:

- 50% of collected waste, such as paper, metal, plastic and glass from households and other sources, to be prepared for recycling by 2020;
- 53% packaging recycled by 2020; and
- 35% biodegradable municipal waste to landfill by 2035.

It is important to note that there is no domestic recycling in the country. These targets relate to separate collection of recyclables— defined as prepared for recycling in the law.

The Plan also proposed a two-bin system that provides for the collection of dry recyclables and wet recyclables. As previously noted, this system is underway in Podgorica. Once the new government takes office, it will become clear whether preparations for drafting of a new plan are taking place.¹⁰⁵

In 2018, the government also announced four waste management centres to be located at Podgorica, Nikšić, Bijelo Polje and Bar. Each centre will determine which waste management method (e.g. MRF, sanitary landfill, waste treatment plant) is most appropriate for the location. In addition, in 2019, the Directorate of Public Works in Podgorica tendered for services to support the implementation and monitoring of waste management in Montenegro.¹⁰⁶ The contract aims to increase the capacity of the Ministry of Sustainable Development and Tourism to implement the national Waste Management Plan and to strengthen the ability of municipalities to implement separation at source and recycling schemes based on local management plans. The

¹⁰⁵ Communication with national expert for Montenegro, October 2020.

¹⁰⁶ Tenders Electronic Daily *Services - 27732-2019 Service Contract Notice*, <https://ted.europa.eu/TED/notice/udl?uri=TED:NOTICE:27732-2019:TEXT:EN:HTML&rearus=Ntt2JgdNuMTnNG5VaeYAsg>

project will support the development of a new National Waste Management Plan for the following period of 2021-2025.

With regards to SUP items specifically, in 2019 the Ministry of Sustainable Development and Tourism confirmed that the new Draft Law on Waste Management will be harmonised with the EU Directive on the reduction of the impact of certain plastic products on the environment (the SUP Directive).¹⁰⁷ The new draft law will therefore include provisions on banning certain SUP items as listed in the SUP Directive, including SUP cotton bud sticks, cutlery straws, food containers and beverage containers.

4.3.3 Egypt

Up to August 2020, the legal framework for solid waste management was spread across different legislations and ministries.¹⁰⁸ The two most significant legislations were Law No. 38/1967 for General Public Cleaning and Law No. 4/1994 for the Protection of the Environment.¹⁰⁹

On 24 August 2020 a new waste management law was approved by the Egyptian parliament. The law aims to improve waste management through several means including:¹¹⁰

- Closing illegal landfills across the country within two years;
- Establishing an authority to oversee and monitor waste management in nationwide, named the 'Regulator';
- Issuing a system of financial and economic incentives and tax and customs exemptions to encourage the production, import, or export of safe, alternatives to single-used plastic bags (via the Minister of Finance, after coordinating with the competent Minister and the Minister of Trade and Industry);
- Investment incentives for waste collectors, small companies and private contractors;

¹⁰⁷ Drobnyak, A. (2019) *Single-use Plastic Products to be Prohibited in Montenegro*, accessed 30 October 2020, <https://www.total-montenegro-news.com/lifestyle/4503-plastic-pollution-montenegro>

¹⁰⁸ EEAA (2011) *National Solid Waste Management Programme (NSWMP) Egypt: Main Report*, accessed 30 October 2020, http://www.eeaa.gov.eg/portals/0/eeaaReports/NSWMP/1_P0122721_NSWMP_Main%20Report_December2011.pdf

¹⁰⁹ Ibrahim, M.I.M., and Mohamed, N.A.E.M. (2016) Towards Sustainable Management of Solid Waste in Egypt, *Procedia Environmental Sciences*, Vol.34, pp.336–347

¹¹⁰ Meguid, M.A. (2020) *Egypt Parliament initially approves draft law on waste management*, accessed 30 October 2020, <https://dailynewsegypt.com/2020/08/19/egypt-parliament-initially-approves-draft-law-on-waste-management/>

With regards to investment, the law proposes recycling and waste management fees. The Government will incentivise recycling facilities for instance by paying per tonne of material recycled.¹¹¹

4.3.4 Morocco

Morocco has no national legislation specific to the focus SUP items in this study. However, an eco-tax law was implemented in 2014, under which that is a 1.5% tax on the sale, import or production of plastic goods. This was expected to generate \$25 million annually for the Fund for the Protection of the Environment (FNE), which would contribute to financing recycling projects.¹¹² The total amount collected to date has not been published.

The broader legislative framework for waste management in Morocco centres on the following key laws:

- Law 28-00: in 2006 a law was adopted relating to waste management and disposal. It outlined the basic processes for collection, transport and treatment;
- Law n° 99-12 based on National Charter of Environment and Sustainable Development; and
- Law 11-03 relating to the protection and enhancement of the environment.

In addition, the Programme National des Déchets Ménagers (National Household Waste Plan (PNDM)) set in place targets to increase landfill capacity by building 80 new landfills and to increase the recycling rate to 20% by 2020. As of 2017 14 controlled landfills had been built, with 11 more under construction.¹¹³ The PNDM also aims to increase waste collection to 100% by 2030 and to close 174 dump sites. WWF reports that by 2019, 60 sites had been closed or rehabilitated.¹¹⁴

¹¹¹ Meguid, M.A. (2020) *Egypt Parliament initially approves draft law on waste management*, accessed 30 October 2020, <https://dailynewsegypt.com/2020/08/19/egypt-parliament-initially-approves-draft-law-on-waste-management/>

¹¹² WWF (2019) *Stop the flood of plastic: a guide for policy-makers in Morocco*, accessed 12 August 2020, http://awsassets.panda.org/downloads/05062019_wwf_marocco_guidebook.pdf

¹¹³ WWF (2019) *Stop the flood of plastic: a guide for policy-makers in Morocco*, accessed 12 August 2020, http://awsassets.panda.org/downloads/05062019_wwf_marocco_guidebook.pdf

¹¹⁴ WWF (2019) *Stop the flood of plastic: a guide for policy-makers in Morocco*, accessed 12 August 2020, http://awsassets.panda.org/downloads/05062019_wwf_marocco_guidebook.pdf

5.0 Policy Measures

5.1 Availability of Alternative Solutions and Business Models

The design of policy measures to eliminate or reduce the consumption of problematic single use plastics must, inter alia, take into account the necessity for the item in question, and, where relevant, the availability of alternative products and systems to switch to. For example, where alternatives are widely available and accessible, or the consumption of the SUP item in question is for convenience only, a ban, or charge on the SUP item is likely to be suitable.

On the other hand, where alternatives to the SUP item of concern are available only to a limited extent, and the need for the SUP is clear, then bans and charges to directly reduce consumption are not appropriate. Instead, it may be necessary to consider the potential for system/design changes at other points in the value chain, for example, to encourage collection of such items, or their redesign, in order to prevent litter, or to support behaviour change to new systems of reuse. In all cases, there will be a need for clear communication and awareness programmes, as well as transparency and accountability, to ensure engagement with and uptake by all actors in the supply chain.

The main types of alternatives available for consideration include single use, non-plastic alternatives (SUNPs), as well as multi-use alternatives (MUs). It is noted that “biodegradable” plastic, or “bioplastic” alternatives, including bio-based plastics and compostable plastics are not considered credible alternatives for single use plastics at present. This is due to widespread misconceptions regarding the options for their end of life treatment, which in reality, are limited and present no added benefit relative to SUPs, except in very few applications. The challenges posed by these materials are further discussed in Appendix A.2.0.

Further, it is noted that between SUNPs and MUs, only the use of MUs will result in the reduction of litter in the marine and terrestrial environment. These alternatives to SUPs are discussed in more detail in Section 5.1.1, with a selection for the impact modelling identified in Section 5.1.2, alongside a discussion of alternative systems of reuse that are relevant to the four SUPS of interest in this study in Section 5.1.3.

5.1.1 Types of SUP Alternatives

Single-use Non-Plastic Alternatives

Single-use non-plastic (SUNP) products refer to items which are made from non-plastic materials though are still designed to be used in the same way as conventional SUP products (i.e. to be disposed of after one use). Products may include bottles, cups, cutlery, food dishes and other packaging. The materials used can include, though are not limited to, wood, cardboard, paper, bamboo, metal and glass. Examples of SUNP alternatives for the four SUPs examined in this study include (but are not limited to):

- Cigarette filters – hemp/ fibre filters, paper filters (not suitable for pre-rolled cigarettes)
- Beverage bottles (inc. caps) – aluminium cans, glass bottles
- Food containers – cardboard containers (without plastic lining), foil containers
- Straws – paper straws

In general, it is noted that a direct switch from SUP to SUNP items in the absence of any further incentive to change consumer behaviour is likely to have little to no impact on the issues of litter and waste generation. However, depending on the specific material chosen for a particular application, SUNP items may be easier to recycle if collected in formal waste management systems (e.g. packing paper for protection in place of polystyrene foam). Similarly, some materials may be associated with fewer negative impacts if landfilled or littered.

It is further noted that switches to SUNPs may also be associated with negative impacts at other points in the product lifecycle when compared to SUPs, including economic impacts (e.g. higher costs of production and therefore prices) as well as environmental impacts (e.g. higher raw material and energy use in the production phase). Therefore, the added value of adopting such alternatives in place of SUPs should be carefully considered, not just from a lifecycle perspective, but also from the perspective of waste prevention and litter impacts.

Multiple Use Alternatives

Multiple use (MU) products are those that are designed for more than one trip/rotation and can be made from any material. Examples include, but are not limited to, water bottles, food containers, reusable coffee cups, “Bags for Life” and metal straws. Public awareness of reusables across Europe has grown and policy interventions have nudged consumers away from SUP products. Indeed, packaging-free shops, reuse start-ups, trials and aisles in supermarkets have increased across Europe in recent years.¹¹⁵

Generally, MU products are made to a higher quality and durability than single-use products, which increases the environmental impact of their manufacture and the cost of their production. Their performance relative to SUP products in both these respects therefore improve the more these items are reused. A key advantage of MU items is that, because of their reusable nature, they tend not to be discarded carelessly as litter, nor are they disposed of after just one use. This has significant implications for waste and litter prevention, as well as the avoidance of the negative environmental impacts associated with these relative to SUPs.

¹¹⁵ Zero Waste Europe, Eunomia Research & Consulting, and Reseau Vrac (2020) *Packaging free shops in Europe an initial report*, accessed 7 July 2020, https://zerowasteurope.eu/wp-content/uploads/2020/06/2020_06_30_zwe_pfs_executive_summary.pdf

A shift from single use plastics to MU alternatives will usually involve a change in business models, in particular, to reuse models to enable the uptake of these alternatives. Reuse models are explored further in Section 5.1.3.

5.1.2 Alternatives Selected for Modelling

Against the background described above, the table below outlines the alternatives to SUPs that are used in the model assumptions. It is noted that the alternatives selected for modelling here are for illustrative purposes only, as the ones that were identified as being most feasible in the EU context. Where more than one alternative presented a viable option for substitution of SUPs, further assumptions were made regarding the likely level of market uptake of each of the alternatives (shown in brackets in the table below), to allow for the comparison of environmental and economic impacts associated with the switch from SUPs to these alternatives. In other country contexts, it is therefore highlighted that other alternatives may be more suitable in terms of availability, accessibility and environmental outcomes.

Table 13 Selection of Alternatives

SUP item	SUNP Alternative	MU Alternative
Cigarette filters	100% fibre, 50% cotton and 50% hemp	N/A
Beverage bottles, inc. caps	Glass bottles (72% of market) Aluminium cans (28% of market)	Reusable plastic bottles (44% of market) Aluminium bottles (with plastic cap, 56% of market)
Food containers (bowls, clamshells, trays)	Cardboard containers with wax coating	Reusable plastic food containers
Straws	Paper straws	Silicone straws (50% of market) Steel straws (50% of market)

5.1.3 Alternative Business Models to Increase Circularity

Of the available business models to support the circular economy, the ones that are most relevant to the issue of single use plastic pollution are models of waste prevention (including reuse) and improved waste management. While improved systems for repair and refurbishment, as well as the development of sharing and leasing models are relevant to reduce plastic waste from other sectors, their scope for application in the packaging sector, and in particular for single use plastics, is limited, and they have therefore not been assessed here.

Considering waste prevention first, a number of reuse systems exist to encourage the uptake of the MU alternatives described above, although two reuse models are most relevant to the items in this study (specifically beverage bottles and food containers). First, consumer led refill involves customers using their own packaging or a brand’s refillable packaging in store, in HORECA establishments, at dispensing systems in vending machines or water fountains (for bottles). The consumer is responsible for cleaning the

container. To encourage behaviour change in such systems, SUPs could still be provided in the short term where relevant, but at a cost to consumers, to ensure that they are incentivised, and enabled, to bring their own containers.

Second, industry-led return schemes enable users to return empty packaging either at a store or drop-off points to be collected, cleaned and refilled by the retailer or producer. Such systems can include deposit return schemes (DRS) to ensure the recovery of such packaging as has been used in New Zealand's "Again Again" scheme for cups.¹¹⁶ Such schemes have also been applied for food containers, as in the case of the recircle system that is in place in Switzerland.¹¹⁷ When the product is part of a return scheme, reverse logistics and associated infrastructure are required to collect, clean and distribute products. A shift to reuse systems would ultimately require not only behaviour change by consumers, but could also place additional requirements on retailers, such as labour for cleaning refill dispensers and space for storage of returned containers.

The use of DRS systems also has the potential to improve the collection of single use plastic waste, potentially preventing litter, particularly for single use beverage containers made of plastics but also of other materials (such as plastic bottles, aluminium cans and beverage cartons). This can be implemented as part of wider extended producer responsibility (EPR) systems to ensure that producers are internalising the costs (including the environmental costs associated with litter and marine pollution) associated with the end of life management of the single use plastics they place on the market. EPR also has the potential to be an important driver of changes to single use plastic design to reduce waste generation and pollution associated with such items. For the items considered here, this could include tethering requirements (so that smaller items that are susceptible to being littered remain attached to the main body of items) for e.g. to ensure that bottle caps do not separate from bottles.

5.2 Relevant Long list of Policy Measures

The following Table presents the long list of relevant policy measures that were selected in the ICF and Eunomia (2018) Assessment of measures to reduce marine litter from single use plastics, Report for DG Environment, European Commission¹¹⁸. Out of these measures, a selection has been made in Section 5.2.2, reflecting the Mediterranean context.

¹¹⁶ <https://www.againagain.co/>

¹¹⁷ <https://www.recircle.ch/en/>

¹¹⁸ ICF and Eunomia (2018) *Assessment of measures to reduce marine litter from single use plastics*, Report for DG Environment, May 2018, https://ec.europa.eu/environment/waste/pdf/Study_supps.pdf

Table 14 Long-list of Relevant Policy Measures

Option	Description
Information campaigns	Information campaigns could be targeted at consumers with a range of aims depending upon the nature of the item. For example, campaigns might; a) aim to improve consumers' understanding of the impacts of littering with the objective of reducing litter rates; b) aim to reduce the incidence of sanitary items flushed down toilets and drains; or c) focus on broader impacts of marine plastics, with the aim of encouraging consumers to take up available SUNP alternatives, or start using MU items, instead.
Mandatory labelling to discourage littering	Whilst information campaigns may have a general, population-wide character, mandatory labelling of widely littered items could help deliver messages more directly to consumers. The effectiveness of such a measure depends on how clearly the message is conveyed and how much of an impact the message has on those who currently litter the labelled items.
Voluntary agreements, voluntary commitments and pledges	A range of measures could be taken by industry which require no specific legal instrument. Voluntary agreements (VAs) are generally those actions taken by industry to bring about changes without the need for changes in policy. At a European level, voluntary agreements typically involve a specific industrial sector, or category of producers; some formal recognition can be given through gaining approval from the European Commission. Voluntary commitments and pledges, on the other hand, might be made by individual companies and are usually made independently. The types of approach that could be considered (and one or more of these could be included in a given VA) are; a) improvements in anti-littering messages on packaging; b) switching material use to alternatives which are demonstrated to degrade in the marine environment; c) supporting the provision of street bin infrastructure; d) supporting litter clear up campaigns; e) implementing refill/reuse schemes in the HoReCa ¹¹⁹ sector; f) agreeing to offer discounts for those using own coffee cups; or g) funding the sorts of campaigns mentioned above.
Specific Requirements on Product Design	Product design measures could be taken to reduce the propensity for certain items to be littered. For example, bottle lids could be tethered to bottles. Bottle lids are found more frequently than bottles in litter counts, suggesting they are either more frequently littered or captured by litter clean-up services less effectively. In addition, cups could potentially be designed to integrate sipping lids. Another potential design change could be to integrate straws into drinks containers, rather than selling such items separately. Evidence suggests that smaller items are less frequently collected in litter clean-up processes than larger items (see section 3 of the Annex). Moreover, it could be speculated that smaller items are also littered more frequently as consumers see smaller items as less impactful. The aim of any design measures, therefore, is to integrate smaller items with larger items such that littering is reduced. Designers could also be required to have regard to insight of a behavioural nature insofar as these help to minimise the likelihood of SUPs (and other items) being littered.
EPR – full cost coverage of	Currently there are very few instances where, under EPR, producers pay for the costs of cleaning up litter. Two examples can be found in Belgium and the

¹¹⁹ HoReCa = Hotels, Restaurants and Catering

Option	Description
litter collections	<p>Netherlands.^{120,121} Under the principle of EPR, the full costs of managing a product at end of life ought to be covered, and this might be assumed to include the cost of cleaning up any items that are littered on land and on beaches. This measure places that burden upon producers, such that those currently operating street, highway and beach cleansing services are compensated. In this case, however, we assume that, in line with the emerging proposal for a revision of the WFD, producers are required to cover 80% of litter clean-up costs.</p> <p>There would need to be a method to discern the required standard of cleanliness to which streets, etc. would need to be cleaned of litter (effectively establishing the overall costs of clean-up). The approach to distributing the costs to producers would be to set up transparent funding formulas that estimated the cost of clean-up based upon the relative proportion of a given item within the total amount collected. However, it should be noted that some items, such as cigarette filters, will be under-represented in the collected wastes as often small items are left on the ground by street sweepers. This would need to be factored into any methodology.</p>
Specified sales restrictions	<p>This measure envisages that regulations are enacted that restrict the sale of SUP items in various locations. Examples might be to ban the sale of SU items at all major events (possibly supported by deposit refunds for cups / glasses, etc.), such as conferences or festivals.</p> <p>Other approaches that could be taken include:</p> <ul style="list-style-type: none"> • Implementing regulations to restrict the sale of any SUP (or SUNP) cutlery, straw, stirrer or drinks cup for use on-site i.e. SU items would only be made available for on-the-go consumption. Most food service outlets that serve on-site and for on-the-go consumption ask the customer if they are eating in or taking out. Those which state eating in would use washable MU cutlery and drinks cups (this measure could also be extended to e.g. the means of delivering food to customers, ensuring MU plates are used wherever possible). • Restricting the sale of drinks bottles for on-site consumption where refillable alternatives could be made available (e.g. tap water, soda streams etc).

¹²⁰ In the Netherlands, packaging producers already make a financial contribution towards litter prevention activities, via the Producer Responsibility Organisation Afvalfonds Verpakkingen. This PRO, which is the only packaging PRO in the Netherlands, then provides funding to Stichting Nederland Schoon to undertake activities to prevent and address packaging litter, including by organising activities aimed at the Dutch public, schools, municipalities and businesses. It is understood that, Afvalfonds Verpakkingen provides financial support of €5.5m per annum to Nederland Schoon (€0.29 per inhabitant), which accounts for 100% of the budget of Nederland Schoon.

¹²¹ In Flanders, Belgium, it is understood that producers pay €9.6 million annually to fund a national litter prevention programme (€1.50 per inhabitant). Fost Plus (the PRO for packaging waste in Belgium), FEVIA (the Belgian food industry association) and COMEOS (the Belgian federation for commerce and services), signed an “open agreement” with Flemish environment minister Joke Schauvliege to invest €9.6 million annually in the fight against litter. This does not appear to cover costs associated with managing litter and the basis upon which this figure was agreed upon is not clear.

Option	Description
	<ul style="list-style-type: none"> Restrict the sales of straws and stirrers by nudging consumers into not using them by requiring drink service establishments to only give out straws and stirrers if specifically requested by the consumer i.e. not by default, and not placing them in places where they are essentially freely available (on the basis that the ease with which they are made available supports their over-consumption).
Measures for adoption by public authorities, including Green Public Procurement (GPP)	<p>Public authorities have specific competences and influence that can be brought to bear in order to reduce the flow of SUPs into the marine environment. Typically, public authorities may give consent to major public events: they also have significant spending power through their procurement of goods and services. Key examples of the actions that public authorities could take include:</p> <ul style="list-style-type: none"> Eliminating / reducing procurement of SUPs; Requiring the use of MU items at events over which the public authority has some means of control (e.g. issuing licenses). <p>They may also be able to influence the actions of franchisees on property which they own.</p>
Implement DRS for beverage containers	<p>A deposit refund system (DRS) on one-way beverage containers provides a clear economic incentive for consumers to return their empty containers, including plastic bottles, to return points. Moreover, any bottles that are initially littered have a relatively high economic value so are picked up by others and returned, and so, ultimately, avoid ending up in the marine environment. DRSs also achieve very high capture rates, so recycling levels can reach over 90%.¹²² However, DRSs are not guaranteed to be implemented by Member States as this target can be met today through existing higher performing kerbside schemes and residual waste sorting at lower cost. Moreover, with the target for all packaging to be recyclable by 2030, this would decrease the necessity for implementing DRSs solely to help meet the target, though Member States could implement for other reasons, such as litter reduction or resource efficiency or increasing recycled content.</p>
Consumption levies	<p>For the purposes of describing this measure, 'levies' are considered to be any economic instrument implemented at the Member State level that increases the cost of SUP items placed on the market, and incentivise non-use, or substitution by SUNP and MU items. The exact nature of the instruments cannot be determined here, but the overarching principles and estimated effects can be modelled in the spirit of an options analysis. Charges and levies are only likely to be effective for some items, and not others. The demand for sanitary towels, for example, is very inelastic as they are considered essential, not luxury, goods. There are, however, some convenience and use barriers that may limit a large shift to reusable items (further market research would be needed to confirm or deny this). Alternative economic instruments, such as EPR for commonly flushed items are likely to be more appropriate (these are modelled in the measures above). Cigarettes are also very demand inelastic; additional price increases would result in limited changes in demand if the price differential of alternatives was not significant.</p>

¹²² Eunomia on behalf of the European Commission, 'Options and Feasibility of a European Refund System for Metal Beverage Cans' Final Report, November 2011.

Option	Description
Reduction targets (SUP)	Reduction targets would set legally binding reductions in consumption from a base year. Data related to the consumption of relevant items would have to be reported to the national governments. Targets are assumed to be as a percentage of the total consumption, but per capita targets could also be set as is the case under the plastic carrier bags Directive.
Ban (of SUP items)	This measure would see complete market bans on the sale of certain SUP items by a given year. Bans would have to be regulated to ensure products are not being sold after the date of implementation.

5.2.1 Case Studies

Six international case studies were reviewed in order to highlight how policy measures to reduce/prevent the consumption of SUP items have been implemented. Information on the effects and impacts is provided where available. However, data on the impacts of such measures was limited, especially where implementation has occurred relatively recently. The examples cover a range of SUP items and different measures and policies. Relevance to the four selected countries was also considered.

The case studies are summarised in Table and further detail provided in Appendix A.2.0.

Table 15 Summary Table of Good Practice Case Studies

Country	SUP item	Policy Option	Overview
Munich, Germany	Disposable drinks and crockery	Ban	A ban on disposable drink containers and tableware for large scale public events on land owned by the authority has been in place since 1990. The City offers rental of mobile dishwashers and crockery sets.
Norway	Plastic beverage bottles	DRS and environmental tax	Since 1999, a national deposit and recycling system for non-refillable plastic beverage bottles and cans has been operated by Infinitum in Norway. The system achieves a 90% return rate.
Copenhagen, Denmark	Plastic beverage bottles	Water fountains	65 drinking fountains have been distributed throughout Copenhagen on streets, in parks, playgrounds or tourist attractions. The water fountains encourage the use of refillable bottles.

Country	SUP item	Policy Option	Overview
UK	Plastic Bottles	Reuse of water bottles	Refill is an initiative run by City to Sea, a system offered by cafes and restaurants that allows consumers to reuse their own water bottles.
Antigua and Barbuda	EPS containers	Ban	Ban on EPS foam food service containers since 2017, including clamshell and hinge containers, hot dog containers, bowls, plates, and hot and cold beverage cups.
Red Sea Governate, Egypt	Plastic bags and cutlery	Ban	In June 2019, the Governor of the Red Sea issued a decision banning single-use and disposable plastics across the Egyptian governorate.

5.2.2 Selected Measures for Impact Modelling

Through the long list of policy measures we have selected the following measures to model using the following criteria: scale effect (high or low), strength of market demand; the size of the market:

Measure	Rational for Modelling
Information campaigns	<p>The aims of the campaign would be to</p> <ul style="list-style-type: none"> • Inform smokers of the impacts of dropping cigarette filters. • To run information campaigns to incentivise consumers to use water fountains, reusable bottles and other alternatives to SU bottles, with the secondary affect that caps an lids would not be littered. • To target the reduction in use of plastic straws, by providing information about the impacts and alternatives – such as ‘the Last Plastic Straw’. • To help consumers understand the issue and decide to take their own containers to restaurants and fast food outlets and to help local businesses understand the impacts and alternatives for investing in reusable box schemes (particularly if implemented at the city level).
EPR- full cost coverage of litter collections	<p>Manufacturers are charged in relation to the proportion of each item type found in litter. There are some issues with this in regard to the informal sector, which plays a significant role in the collection/recycling of EPR for plastic bottles. How the costs of this waste management are recovered from producers would require further research.</p> <p>Most typical EPR schemes are designed to cover the full net costs of waste management, mainly recycling and residual waste collections, sorting, and subsequent reprocessing, of which litter costs are only one aspect. Therefore, whether or not comprehensive EPR schemes are already in place for the collection and management of packaging waste in each country, this measure relates only to the recovery of the costs of litter collection for the items of relevance.</p>
DRS for beverage containers	<p>A 90% recycling target for beverage containers, for example, is highly feasible, as a number of EU Member States are already achieving over 90% recycling rate. This could also be particularly impactful when done in conjunction with EPR on litter.</p>
Consumption levies	<p>Levies would be of benefit for food packaging and could also be introduced for SUNP alternatives to SUPs subject to bans. An example of this would be paper straws. In the absence of a charge on paper straws, a ban on plastic straws would likely lead to a shift to paper alternatives. To maximise the waste prevention effect of the ban on plastic straws, a charge on paper straws would be advised, as this would encourage either multiple use straws, or the avoidance of straws.</p>

Measure	Rational for Modelling
Bans	<p>This measure is feasible for plastics straws and expanded polystyrene food containers:</p> <ul style="list-style-type: none">• Bans on plastic straws are part of the SUP Directive. As noted above, it is recommended that this be accompanied by a consumer facing charge on single-use paper straws, to maximise waste prevention.• Bans on expanded polystyrene food containers (not recyclable) are included in the SUP directive. These drive consumption towards recyclable plastic, cardboard, and/or multi-use alternatives; and• Bans on drinks bottles are possible but requires highly developed infrastructure and supply chains for multi-use alternatives, and so are not feasible at this stage of policy development.

6.0 Assessment Model

6.1 Model Methodology

The impact assessment model was used to calculate the financial and environmental impacts of each of the measures, for each of the countries within this study. As discussed in Section 3.1, the analysis utilised a model previously developed by Eunomia for DG Environment, European Commission. A detailed technical description of the model can be found in the report from this modelling work.¹²³

The modelling approach can be summarised as follows:

- **Baseline:** Baseline data for each of the SUP types modelled. Baseline projections were forecast out to 2030, and include the projected impacts of already firmly planned policies on SUP consumption and waste management. Assumptions on baseline consumption are detailed in Section 4.1, and other model inputs are detailed in Appendix A.4.0;
- **Define Policy Measures and Model Impacts:** Key assumptions were made to model the future impacts of the selected measures (see Section 5.2.2) on consumption and waste management. These were estimated by the project team based upon the assumptions used in the SUP model for DG Environment, and modified where relevant to reflect the expected change from the baseline for the countries modelled in this study. The measures can be expected to impact on:
 - **Consumption** – measures can drive a shift away from consumption of SUPs and into non-plastic and multi-use alternatives
 - **Recycling rates** – deposit refund schemes lead to significantly increased recycling rates for drinks bottles
 - **Litter rates** - the % of material placed on the market that is littered; and
 - **Litter collection rate** – the % of littered material that is collected and managed as waste.
- **Model Economic Impacts:** The effect of these changes in consumption have a range of different economic impacts. As the market shares of SUPs, SUNPs and MU items shift, some producers lose and some gain.
 - In some cases, the measures are also likely to stimulate innovation, in terms of SUNP and MU equivalents. Although this represents a potential opportunity for business growth in the countries modelled, one that may be global, given the rapidly growing awareness of this issue, these are not quantified in the study (being, as they are, uncertain).

¹²³ ICF and Eunomia (2018) *Assessment of measures to reduce marine litter from single use plastics*, Report for DG Environment, May 2018, https://ec.europa.eu/environment/waste/pdf/Study_sups.pdf

- Businesses are also affected through changes in fees to any extended producer responsibility schemes, or other obligations such as changes to information campaigns.
- The costs of managing the waste items were also included, although as the total weight of these items in total municipal waste is low the changes are small.
- **Model Environmental Impacts:** In terms of consumption related elements, life-cycle assessments for the SUP, non-plastic, and multi-use alternatives were used to model the change in resource use, greenhouse gas emissions and emissions of other pollutants. In addition, changes in consumption directly affects the quantity of material at a given end destination. The impacts of these changes were also estimated, including the environmental disamenity associated with changes in the quantity of litter.
- **Model Impacts on Employment:** The direct impacts of these measures were calculated for jobs associated with manufacturing, recycling, mixed waste treatment, refill schemes (for multi-use items) and litter-clean up. Estimates of jobs associated with DRS schemes are also included.

6.2 Impact Assumptions

This section sets out and explains the key assumptions that were made to model the future effects of the various options being assessed (Table 16). The figures were estimated by the project team based upon the experience gained through this both this study and the previous study for the European Commission, discussions with stakeholders in the workshops and any relevant literature.

A x% reduction indicates a reduction of x% from the baseline figure, whereas a figure of 'x percentage points' indicates an absolute reduction in the rate for consumption switches, and the absolute rate for the rates (for example, if the baseline rate were 50% a 10% increase would mean 55% whereas a 10-percentage point increase would mean 60%).

Table 16: Modelling Assumptions

Option	Modelling Assumptions
Information campaigns	<p>Without broader policy changes, information campaigns might be limited in their effect. The segment of society which may be most amenable to changing their behaviour may be that with environmentally positive attitudes, but they may also already have altered their own behaviour.</p> <p>The following changes are modelled under this option for all items:</p> <ul style="list-style-type: none"> ● Littering rate decreases by 5% and 10% by 2025 and 2030 respectively; ● Littering collection rates remain at baseline level; ● Recycling rates remain at baseline levels; and ● Consumption of SUP items is reduced by 5% from baseline levels by 2030. <p>The split between SUNP and MU differs for each item:</p> <ul style="list-style-type: none"> ○ Cigarette Filters - 100% switch to SUNP;

Option	Modelling Assumptions
	<ul style="list-style-type: none"> ○ Drinks bottles and Straws, 10% switch to SUNP and 90% to MU; and ○ Food containers – 75% switch to SUNP and 25% switch to MU.
EPR – full cost coverage of litter collections	<p>To model this measure the following assumption has been made. In order to half the amount of litter currently not collected, the unit cost of litter clean-ups would have to double.</p> <p>The following changes are modelled under this option for all items:</p> <ul style="list-style-type: none"> ● Litter collection rate increases to a level equivalent to capturing 50% of the remaining uncollected litter (e.g. Litter Rate = Litter Rate + (100% – Litter Rate) x 50%) by 2030 (30% by 2025). ● Litter clean-up costs double. These costs are assumed to be met by producers via fees paid to EPR schemes.
Implement DRS for beverage containers	<p>Three primary effects are modelled due to implementation of a DRS. Firstly, recycling rates are assumed to increase to 90% by 2030¹²⁴ with an initial recycling rate of 80% by 2025. Secondly, the initial litter rate will decrease as consumers return the containers to the DRS. Finally, the litter collection rate will increase as some littered bottles will be picked up and returned to the DRS to claim the deposit value. It is assumed that DRS are implemented over the period to 2030.</p> <p>The following changes are therefore modelled by 2030 under this measure for plastic beverage bottles only:</p> <ul style="list-style-type: none"> ● Recycling rate increases to 90%; ● Litter rate reduces to 80% of the baseline level; and ● Litter collection rate increases by 5%. <p>Producer fees for DRS schemes show a large degree of variance in existing DRS schemes, depending on a large number of specific local factors. For this study we have assumed that producers will pay a fee of one Euro cent per container to the DRS scheme – this is a typical fee for countries with similar economic situations to the countries modelled in this study.</p>
Consumption levies	<p>The measure was modelled by assuming a levy at the point of consumption was put in place for these items, with the following rates of levy per item:</p> <ul style="list-style-type: none"> ● Straws – 5 Euro cents ● Food containers - 20 Euro cents <p>To simplify the approach to modelling of this measure, it was assumed that a similar charge to those implemented on carrier bags might be implemented on the items considered here. The level of the charge is up to €0.10 in many countries within the EU, although €0.05 is perhaps a more appropriate figure for this study given the relative purchasing power parity of the modelled countries compared to, for example, a typical western European country. This value is added for items which are currently given away at the point of sale for free, or are integrated into products with a low unit cost. For the items sold as integral packaging to the product being</p>

¹²⁴ <http://infinitem.no/english/the-deposit-system>

Option	Modelling Assumptions
	<p>sold (food containers) the consumer pays for the overall cost of the product + packaging, and so the levy would need to be higher to have a similar effect (as economic theory suggest it is the relative price that determines change in behaviour, whereas carrier bags are considered zero cost as they were given away free by shops, a €0.10 charge on an item costing €1-5 is only a fractional increase). The price-demand relationship has also to be determined to assess the effects of the various charges on demand. Unlike the carrier bag impact assessment, there was no country wide example to base the likely effects upon (e.g. the Irish carrier bag levy). It has been assumed that for those items which are currently given away for free and not integrated into the purchased product (straws), the price effect is in line with that for carrier bags, i.e. an 80% reduction for a €0.05 charge – as stated above, the assumed current zero cost of the item implies a significant relative increase in price so a significant decrease in demand would be expected.</p> <p>Levies are assumed to be introduced in 2025, giving additional time for some items to develop alternatives and behaviours to adapt:</p> <p>Levies are assumed to decrease consumption of SUP relative to baseline levels by 30%. In addition, for straws, the total level of consumption of those items reduced by 80% as consumers decide they no longer need the items at all.</p> <p>The % reduction of SUP relates to a consumption switch to SUNP and MU, these vary depending on item type:</p> <ul style="list-style-type: none"> • Straws – 10% SUNP and 90% MU • Food Containers – 75% SUNP and 25% MU <p>No change to littering or recycling rates are modelled.</p>
Bans	<p>The approach to modelling bans is to assume a 100% reduction of the consumption of SUP items by 2030 with a 50% reduction in 2025, where MU alternatives exist that could be adopted by the whole market.</p> <p>A 100% switch to MU by 2030 was therefore modelled for straws and food containers only. In addition, for straws, the total level of consumption of those items is reduced by 50% as consumers decide they no longer need the items at all.</p> <p>No change to littering or recycling rates are modelled.</p>

6.3 Limitations

The model has the following limitations:

- Market data were not available for all countries so had to be estimated using GDP per purchasing power parity (PPP);
- Assumptions regarding the fates of the items through the waste management system were estimated in some case as country specific data was not available. This may reduce the accuracy of the results;
- Forecasts are based on expert judgement as pilot studies / trials / country wide examples or evaluations are not available for these products-measures;
- Input data is of variable quality;

- The approach to assessing welfare costs is straightforward and not fully comprehensive, given the number items needing to be assessed;
- Employment impacts do not include any loss of informal sector jobs as waste management is formalised and/or estimates of the amount of informal sector workers that could be partially or fully formalised.
- Evidence and impacts on marine wildlife are still being understood, and so the impacts are uncertain, and potentially understated; and
- All countries in this study, to a greater or lesser degree, dispose of waste at uncontrolled (non-sanitary) landfills, open dumpsites and/or by burning in the open. Data on the extent of these practises is either poor or non-existent, as are estimates of unit environmental externalities associated with, for example, emissions from open burning, the visual disamenity of dump sites and associated litter, down-stream impacts on biodiversity etc. Thus, externalities are not calculated for this 'poorly managed' waste, and therefore environmental impacts as reported will be understated.
- It is not possible to value water and land use with any certainty due to the lack of scientific literature, and so these impacts cannot be compared against the rest of the costs and benefits in monetary terms.

These limitations suggest that there is some margin of error in the results, and further research would be needed to confirm the level of accuracy. The model results are presented to a level of detail (2 decimal places for example) though this does not mean the figures are precisely accurate. The margin of error is not possible to calculate and the figures should be viewed as indicative. However, this research, as with the Eunomia study for DG Environment, has made a significant step forwards in understanding the impacts associated with the mismanagement of SUP items.

7.0 Impacts of the Measures

The assessment of impacts has considered each of the Measures set out in Section 5.2.2. These have been assessed against the baseline i.e. ‘business as usual’ scenario.,

The assessment considers the following impacts outlined in Table .

Table 17: Summary of Impacts Assessed in the Analysis

Type	Specific Impact	Description
Environmental	Reduction in marine plastics, thousand tonnes	The absolute reduction in plastics entering the marine environment by weight.
	Marine litter reduction - % of SUP by count	The relative reduction in SUP entering the marine environment by number of items reduced.
	Change in GHGs, million tonnes	The change in GHG emissions from production, washing and waste management.
	Change in external costs (total), € million	The value of external costs arising from emissions of GHGs and other air pollutants from production, washing and waste management, as well as the external cost of littering on land and plastics entering the marine environment.
	Change in manufacturing related land use, km ²	The change in land use associated with the manufacture of SUP, SUNP and MU items. This is reported separately as it cannot be valued as an external cost.
	Change in material demand, thousand tonnes	The total change in material demand, as a measure of resource efficiency.
Economic	Change in consumer costs, € million	The change in the value of sales of the items to the consumer.
	Change in costs to retail sales, € million	The reduction in turnover of retailers selling SUP, SUNP and MU items.
	Commercial washing and refill scheme costs, € million	The costs associated with running commercial refill schemes and washing MU items.
	Business compliance costs, € million	The additional costs associated with, for example, complying with the need to provide annual data returns on # items sold on an annual basis.

Type	Specific Impact	Description
	Change in costs to producer sales, € million	The reduction in the turnover of producers manufacturing SUP, SUNP and MU items.
	Producer fees for EPR / DRS, € million	Producer fees for the costs of litter collection / funding DRS schemes for beverage bottle collection and recycling
	Change in waste management costs, € million	The costs associated with the management of items when they become waste, including, collection, recycling, mixed waste treatment/disposal, and litter collections
	Information campaigns, € million	Any costs associated with running information campaigns.
	Additional tax revenue, € million	Tax revenue from consumption levies, assumed to accrue to general taxation.
Social	Change in employment, Thousand FTEs	The change in employment from the above-mentioned activities.

Country specific results were modelled, and demonstrate that the overall schema and order of the results i.e. the relative impacts of measures compared to one another, are broadly similar for all countries. In other words, a similar picture is painted in terms of which policy measures lead to the greatest marginal changes across the types of impacts modelled. Given these observed similarities, the results are presented here as the sum of impacts for the four countries included in this study, and summary results by country are detailed in Appendix A.1.0.

These similarities suggest that the broad conclusions and/or recommendations from this work are likely to be applicable to countries outside those focused on in this study, particularly those which are similar to the countries modelled in this study in terms of relative rates of consumption, waste management activities, as well as more general socio-economic indicators.

Results are also presented in terms of the marginal impact achieved through the implementation of single measures. In practice, more than one policy measure may be implemented at any given time, and this may give rise to increased benefits. Combined impacts of any proposed groupings of policy are not presented here, however, these are discussed further in our recommendations (Section 8.0).

The summary impacts of the measures are presented in tabular form in Table 18, before we discuss the environmental, economic and social, in sections 7.1 to 7.3 below. All results are for one year, 2030, which was chosen as by this year it is assumed that the

modelled measures will be fully implemented. Results are presented as the marginal impact, in this year, relative to the baseline scenario.

Table 18: Model Outputs (2030) – Option Comparison, Relative to Baseline

	Ban (of food containers and straws)	Consumption levies	DRS for beverage containers	EPR – full cost of litter	Information campaigns
Marine litter by count (as % of items in study)	-0.9%	-0.7%	-2.9%	-55%	-15%
Marine Litter, thousand tonnes	-0.8	-0.3	-16	-10	-2.9
GHGs, million tonnes CO ₂ e	-0.04	0.0	-0.6	0.001	-0.2
External Costs, € million	-159	-44	-2,261	-1,474	-427
Costs to consumers, € million	-107	163	-	-	30
Costs to retailers (reduced turnover), € million	107	-0.7	-	-	-30
Business compliance, commercial washing & refill scheme costs, € million	177	77	-	-	2.2
Costs to producers (reduced turnover + producer fees for DRS / EPR), € million	54	-0.4	185	121	-15
Waste management costs, € million	-0.8	0.3	-15	0.6	-1.3
Information campaign costs, € million	-	-	-	-	59
Additional tax revenue, € million	-	162	-	-	-
Employment, 000 FTE	3.3	0.3	11.5	0.01	0.2

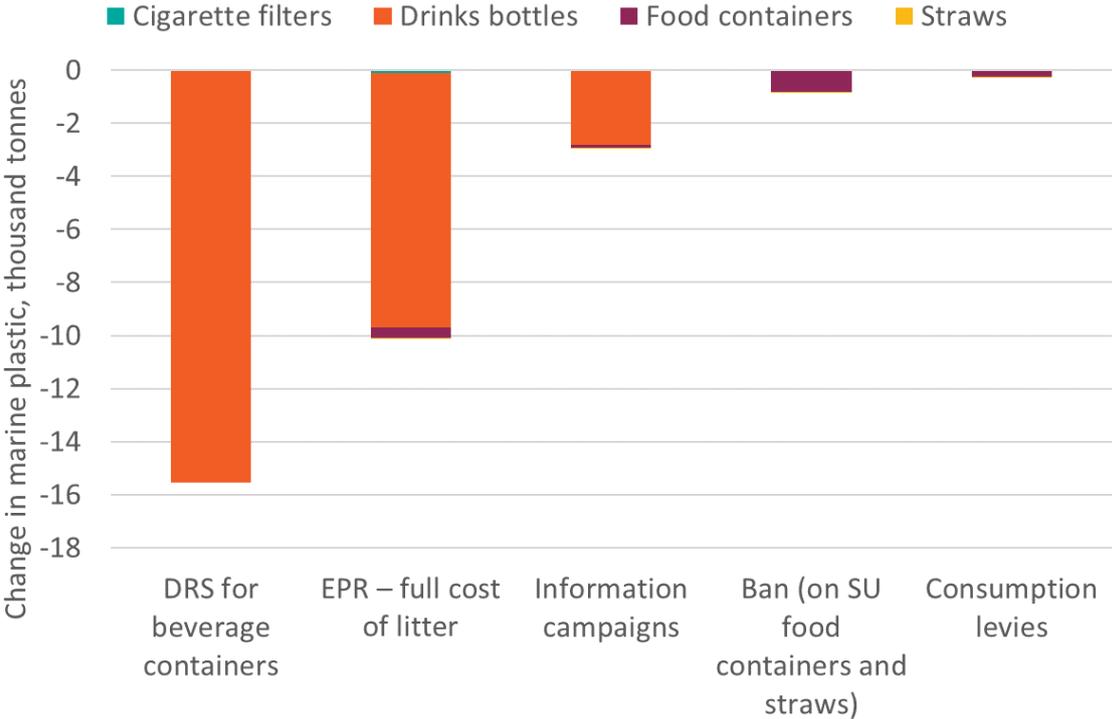
Table 18 indicates the changes in environmental and economic parameters. Of particular interest is the fact that the environment benefits are far greater than the financial costs to producers and retailers. The change in sales to producers are somewhat lower than

the change in sales to retailers, which is entirely to be expected as the latter is simply a reflection of the former, and retailers sell products at a mark-up. These two figures for sales reductions should be seen neither as additive, nor as, strictly speaking, costs, in the sense of a loss to the economy. The loss might rather be approximated by the loss in GVA associated with retail sales, taking into account the multiplier effects. However, specific GVA data for the items in question was not available. Employment impacts are generally positive when strong policies lead to increases in the implementation of refillable take-away box schemes, as they require reasonably significant numbers of staff to operate them, in relation to collection and washing. These offset reductions in staffing at manufacturing related to decreased turnover. DRS schemes are a particular case which lead to a large increase in employment, both through the running of the DRS system itself, and in increased jobs at plastic reprocessors (assuming this capacity is created domestically).

7.1 Environmental

The model assesses a range of environmental impacts, as detailed in Figure 1. Firstly, the changes in plastic litter reaching the marine environment (in weight-based i.e. tonnage terms) are presented below. The measures are ranked in this chart in order of most to least impact.

Figure 1: Change in Marine Plastic Litter, Thousand Tonnes (2030)

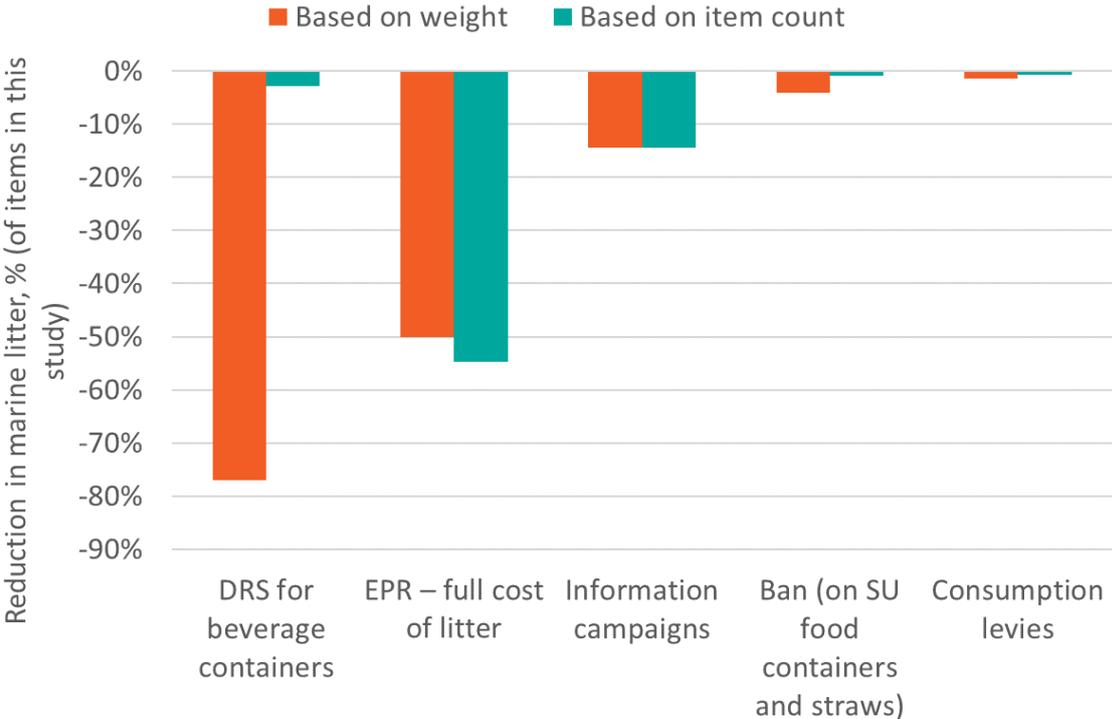


This figure clearly shows that, in terms of tonnage, Deposit Refund Schemes lead to the greatest reduction in (littered) marine plastics reaching the environment, in the order of 16 thousand tonnes. EPR schemes for litter, which are assumed to lead to a 50% increase

in litter collection by 2030, are modelled to reduce marine littering by c. 10 thousand tonnes.

These impacts can also be viewed in terms of the impact in terms of number of items of litter. Figure 2 compares the % reduction in littering (of items in this study) in both weight-based and unit-based terms. As shown in Figure 2, DRS schemes lead to the greatest reduction in the weight of litter, however, in terms of item count, EPR schemes are shown to be the most impactful. This difference is accounted for by the variability in unit weight of the products in this study. EPR schemes are modelled to increase litter collection for all product types, including cigarette filters, which are consumed in much greater quantities (in the region of one order of magnitude, see Section 4.1) than other products, but have a much lower unit weight (approx. 1/80th of a gram, relative to beverage bottle weights which commonly weight between 20 and 50 grams).

Figure 2: Reduction in Marine Plastic Litter, % of Items in this Study (2030)



The modelled change in greenhouse gas emissions for the major sources of emissions throughout the product lifecycle are shown in Figure 3. In terms of greenhouse gas emissions, DRS schemes show the greatest environmental benefit, of approximately 0.6 million tonnes of CO₂ equivalent prevented each year. This is due to the carbon benefits of a significant increase in recycling of beverage containers, with a further contribution from a reduction in plastic sent to incineration.

Measures which drive a shift in consumption away from single use plastic to non-plastic and multi-use alternatives (i.e. information campaigns, bans and consumption levies) also lead to a carbon benefit. Increased reuse also leads to waste prevention and

associated carbon benefits from reduced incineration. These benefits significantly offset the additional greenhouse gas emissions produced through washing (of multi-use products after consumption), and the decrease in carbon benefits from recycling (due to waste prevention the total tonnage of waste available for recycling decreases, although the recycling rate does not change).

Figure 3: Change in Greenhouse Gas Emissions, Million Tonnes CO₂e (2030)

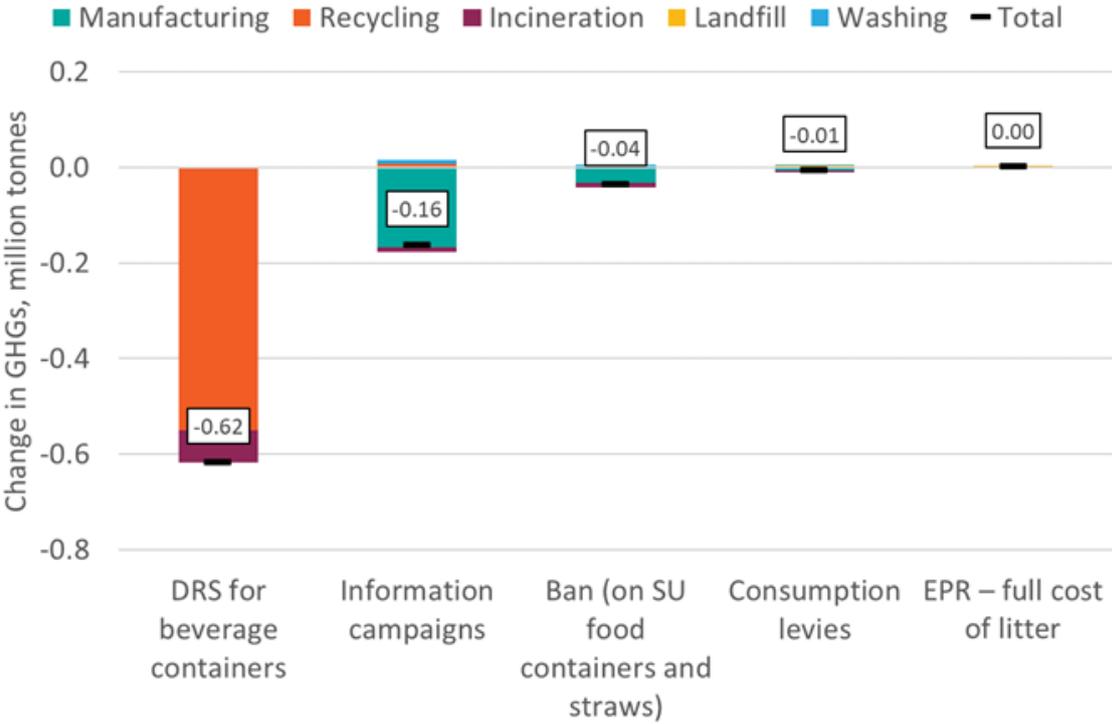
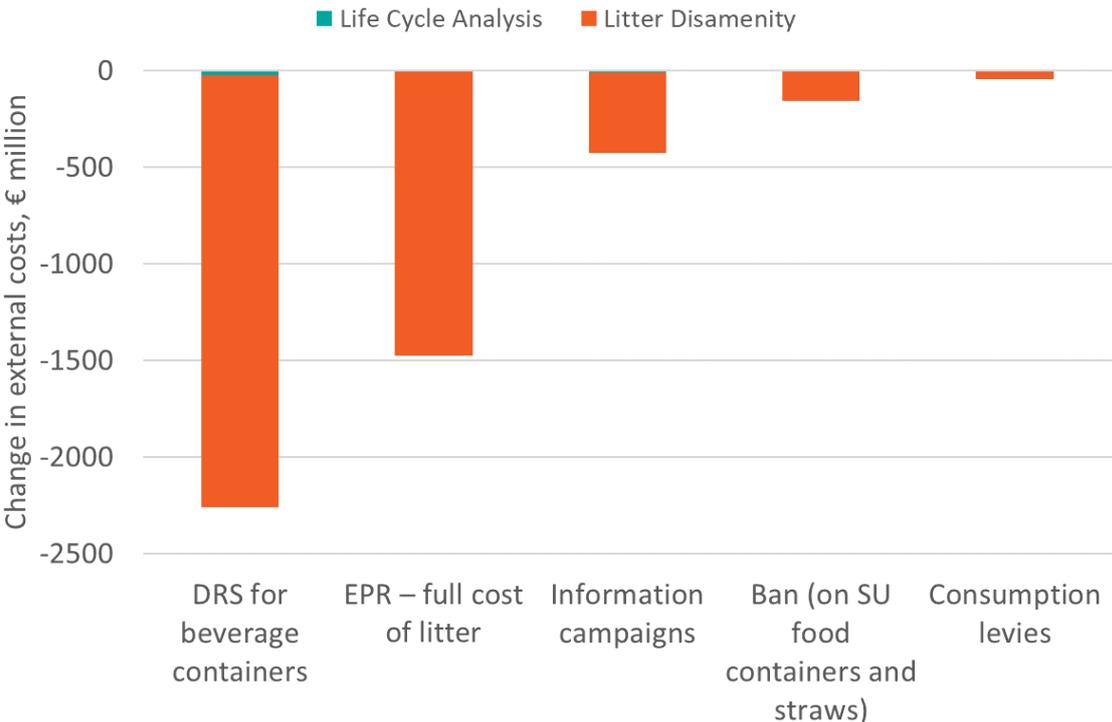


Figure 4 presents the change in environmental externalities, these include both the visual disamenity associated with littering, and the externalities calculated using life cycle analysis (LCA). These relates to the monetised emissions of greenhouse gases and local air pollutants (e.g. nitrogen oxides and particulate matter) emitted throughout the lifecycle of these product, including extraction and processing of the raw materials, manufacturing, distribution, use, recycling, and final disposal.

Figure 4: Change in Environmental Externalities, € million (2030)



In terms of monetised environmental impacts, although the LCA related impacts are significant, the litter-related externalities are much higher. Furthermore, these should be viewed as a somewhat conservative estimate, given the significant degree of poor waste management practises i.e. uncontrolled landfills, open burning and/or dumping in some countries, for which there is insufficient data to calculate environmental impacts (see Section 6.3). The reduction in litter-related externalities is greatest for policies which lead to the largest (weight-based) reduction in litter i.e. DRS schemes.

The modelling also includes an assessment the overall change in material demand, as shown in Table 19. Bans are shown to lead to the greatest decrease in demand for material, as they drive consumers to switch to reusable alternatives.

Table 19: Change in Material Demand and Land Use (2030)

	Change in material demand, thousand tonnes
Ban (on SU food containers and straws)	-22
Information campaigns	-8
Consumption levies	-3
EPR – full cost of litter	0
DRS for beverage containers	0

7.2 Economic

The economic impacts of the measures modelled are presented in Table 20: Change in Financial Costs, € Million (2030). In respect of the overall impact of the different options, the following comments are made:

- Measures targeting consumption of SUP products (bans and consumption levies) can lead to either an increase or loss in sales, depending on the type of product that consumption is switched to. Where the general trend of change in consumption is towards reusable products (as for bans) this leads to a net loss in sales, leading to savings for consumers, and reduced turnover for retailers and producers.
- This same logic applies to changes in costs for producers, for whom there are both net losses (for bans) and net gains (consumption levies and information campaigns) depending on the measure modelled. All measures lead to a loss for producers of plastic products, and net gains are only made by producers where the increased turnover for producers of alternative products is greater than this lost revenue.
- Note that it would be wrong to consider the change in sales by retailers as additive to the change in sales by producers. The two figures reflect the same type of change, and would overstate the full economic consequences of the changes – note the retailer turnover is higher reflecting the mark-up in sales over and above production costs;
- Producer fees for EPR schemes for litter are approximately €121 million, and €185 million for a DRS scheme (assuming a 1 Euro cent producer fee). These fees reflect the costs of internalising litter collection and beverage bottle collection / recycling respectively, in-line with the polluter pays principle.
- Business compliance costs are estimated to be close to zero for most measures. The compliance costs increase as more businesses are required to report, for example, information related to the reduction in use of SUPs for the consumption levies.

All other costs are detailed further in the below sections.

Table 20: Change in Financial Costs, € Million (2030)

	Consumers	Retailers		Retailers + other businesses	Producers			Public authorities			
	Change in consumer costs	Cost to retail sales (reduced turnover)	Commercial washing and refill scheme costs	Compliance costs	Cost to producer sales (reduced turnover)			Producer Fees for DRS / EPR	Waste management costs	Information campaigns	Additional tax revenue
					SUP	SUNP	MU				
Ban (on SU food containers and straws)	-107	107	177	0	61	0	-8	0	-0.8	0	0
Consumption levies	163	-1	13	64	28	-28	-1	0	0.3	0	162
DRS for beverage containers	0	0	0	0	0	0	0	185	-14.8	0	0
EPR – full cost of litter	0	0	0	0	0	0	0	121	0.6	0	0
Information campaigns	30	-30	2	0	63	-77	-1	0	-1.3	59	0

7.2.1 Impacts on Producers

Producers of single use plastic items are negatively affected by a reduction in consumption of their products when bans or consumption levies are introduced. In both these cases, there are shifts in demand so that whilst consumption of SUPs falls, demand for SUNPs and / or MU items increases. In practice, therefore, wherever there are losers in the market, so there are also winners. The effects do not balance each other out: the overall number of items purchased changes, and is redistributed across the market. Because the products being manufactured are relatively specific, the relevant economic data regarding, for example, the change in Gross Value Added (and associated multiplier effects) associated with the shifts in demand across SUPs, SUNPs and MU items are not available at the desired level of resolution. As a result, the assessment reports on the estimated change in the value of sales. These changes are based on estimates of the unit sales prices for the different items.

The assessment indicates that for bans on food containers and straws, SUP producers lose €61 million, with compensating gains for others at €8 million. The proportionately greater shift towards SUNP products (relative to MU) for information campaigns leads to a modelled increase in net sales for producers, as SUNP products are generally priced higher than the SUP products they replace. For consumption levies, SUP producers lose €28 million, with compensating gains for others at €29 million. Whilst for information campaigns, SUP producers lose €63 million, with compensating gains for SUNP and MU producers of €78 million.

These figures are not significant in the macroeconomic context. The corollary of this is that consumers may reduce expenditure (and although this has not been examined in this).

Most of the countries modelled import a significant proportion of the products modelled. The domestic impacts of this change in producer turnover will therefore be lower, in proportion to the relative amount of domestic manufacturing.

The extent to which individual businesses are negatively affected will depend upon a number of aspects, including:

- The proportion of their turnover (and indeed profit) accounted for by the sale of the specific single use plastic items in question;
- Their flexibility in being able to re-orientate production to other plastic items, such as reusable plastic items, and the revenue that they might generate from doing so; and
- Their ability to manufacture items out of materials other than plastic.

As well as there being clear benefits to some parts of industry from the estimated shift in consumer demand, there may be dynamic effects also, related to innovation in the sector. For example, alternatives to some SUP items are not yet at a stage where one could clearly state that they were biodegradable in the marine environment. Whilst producers should certainly not be designing products with 'being littered' in mind, the potential for alternative, less environmentally damaging options to be developed is

considerable. Similarly, there may be new business models that could be developed around the way MU items are made available to consumers, and taken back, in such a way that costs decline, especially as options are scaled up, and demand increases.

There are two measures which aim to internalise the costs of waste management i.e. to shift the costs from the public to producers, in-line with the polluter pays principle. EPR schemes require that the costs of litter-clean up are paid by producers. DRS schemes require producers to pay for any short-fall (i.e. net deficit) in revenue for the scheme, so that schemes are cost-neutral. Prior to producer fees, after accounting for the costs of running the scheme and the revenues from unredeemed deposits and material sales, most DRS schemes run at a loss, particularly when run primarily or solely for the purpose of collecting lower-value material e.g. PET beverage bottles.

For EPR schemes, the increased cost of collecting 50% of all litter by 2030 passed on to producers is €121 million. For DRS schemes, costs are modelled based on a producer fee of 1 Euro cent – this is a typical fee for countries with similar economic situations to the countries modelled in this study. Based on this fee, a DRS scheme would cost producers €185 million in producer fees per annum. It is possible that a well-run and efficient DRS could reduce producer fees further, perhaps by as much as 50%, so this cost could also reduce, in the best-case scenario, to around €100 million.

7.2.2 Impacts on Retailers

For food and drink related items (food containers, straws and drinks bottles), retailers have to pay for the single use plastic items that they then provide to customers ‘free of charge’, or at least without the cost being explicitly passed on – albeit it will be covered by the consumer in the overall price the consumer pays. The zero cost at point-of-sale that is common for such items routinely leads to their over-consumption, a matter clearly demonstrated by the dramatic impact on consumption which have been occasioned by relatively small levies. With a shift to reusable items, the retailer will avoid the upfront cost of purchasing the single use items, and thus has an opportunity to either increase revenue (if the saving is not passed on to the consumer) or share the savings with consumers (or indeed pass them on in full).

There can be a cost in having to provide reusable items for consumption on the premises, for example, in terms of washing, but these reusable items can be expected to ‘pay for themselves’ over time as long as breakages are not excessive. However, the shift to non-plastic single use alternatives may lead to an increase in costs to retailers if these are more expensive, and they cannot, or choose not to pass these costs on to consumers. Alternatively, such as shift (as we have modelled) could lead to increases in overall turnover, as consumers purchase a similar number of now more-expensive products.

For retailers engaged in a deposit refund scheme, there will be costs. However, these are usually compensated for through the payment by system operators of handling fees for every used beverage container returned via the retailer.

The turnover of retailers falls when bans are implemented (reflecting the loss in producer sales also), by €107 million respectively. For consumption levies and information campaigns, similarly to producer sales, retail turnover is modelled to increase by €1 and €30 million respectively.

We have calculated the change in commercial washing and refill costs prompted by a shift to multi use products separately, and these range from €2 million to €177 million. These figures are based on average European values for washing/refill costs, as no specific country data is available, so may be somewhat of an overestimate. These might be expected to be internalised in retail sales prices, so the reduction in sales turnover may be overstated by the bare 'cost to retail sales' figures.

Business compliance costs are estimated to be close to zero for most measures. The compliance costs increase as more businesses are required to report, for example, information related to the reduction in use of SUPs for the consumption levies, which is modelled to lead to compliance costs of approximately €62 million. This cost is assumed to be borne primarily by retailers, but may in-practice be shared across retailers and producers, as well as other businesses e.g. the food service and hotel sectors.

7.2.3 Impacts on Consumers

For consumers, the impacts will vary depending on their consumption habits and their own pre-existing preferences in respect of using reusable items.

When consumers decide to use their own MU items, they will need washing in order to keep them clean and usable. Therefore, there may be some additional costs from washing the items. However, as they are no longer purchasing many SU items, the overall cost of the items to them falls.

The analysis indicates that, in line with the loss in retail and producer sales, consumers would stand to reduce their net financial outlay if bans were introduced, and increase it if information campaigns led to a shift towards SUNP products with higher purchase costs. Consumption levies create an additional cost burden on consumers, as the levy is applied to the purchase price of the product at the point of sale – these levies account for approximately €162 million of the consumer costs shown in Table 20: Change in Financial Costs, € Million (2030). Note that these increase in costs to consumers will only occur if, as discussed above, retailers choose to pass these costs on to consumer. If retailers were to do this then this would increase their turnover.

In principle, these changes may shift from/to other economic sectors (not all of which might have environmentally beneficial outcomes). In principle, though, where retailers and producers lose through loss in sales, consumers may gain, and they may use the money they save to spend on other things.

7.2.4 Impacts on Public Authorities

Waste prevention through the use of reusables will mean lower costs of waste treatment for public authorities (where such costs are covered by public authorities). Reduced levels of litter (both in bins and on the ground) will also mean reduced costs of

litter collection and management. For example, if there is a lower quantity of waste produced overall, there will be less waste to recycle and treat in mixed wastes. If litter prevention policies are effective the demand on municipal street cleansing services will fall. Furthermore, where collection and recycling costs of beverage bottles are covered by a DRS, then the requirement for municipal waste collections by local authorities is reduced, leading to a cost saving.

Public authorities will benefit from any tax revenue from consumption levies. Levies lead to benefits regardless of the specific outcome they produce. If they fulfil their primary purpose (in terms of providing environmental benefits) then consumption of SUP is reduced, whilst some tax revenue is still accrued. Whilst if demand is inelastic i.e. there is little change in consumption, then public authorities stand to receive a greater amount of tax revenue. Overall, as discussed in Section 7.2.3, estimated tax revenue is approximately €162 billion per annum. These figures are only indicative, as they are very sensitive to both the rate at which the levy is set, and the response in demand.

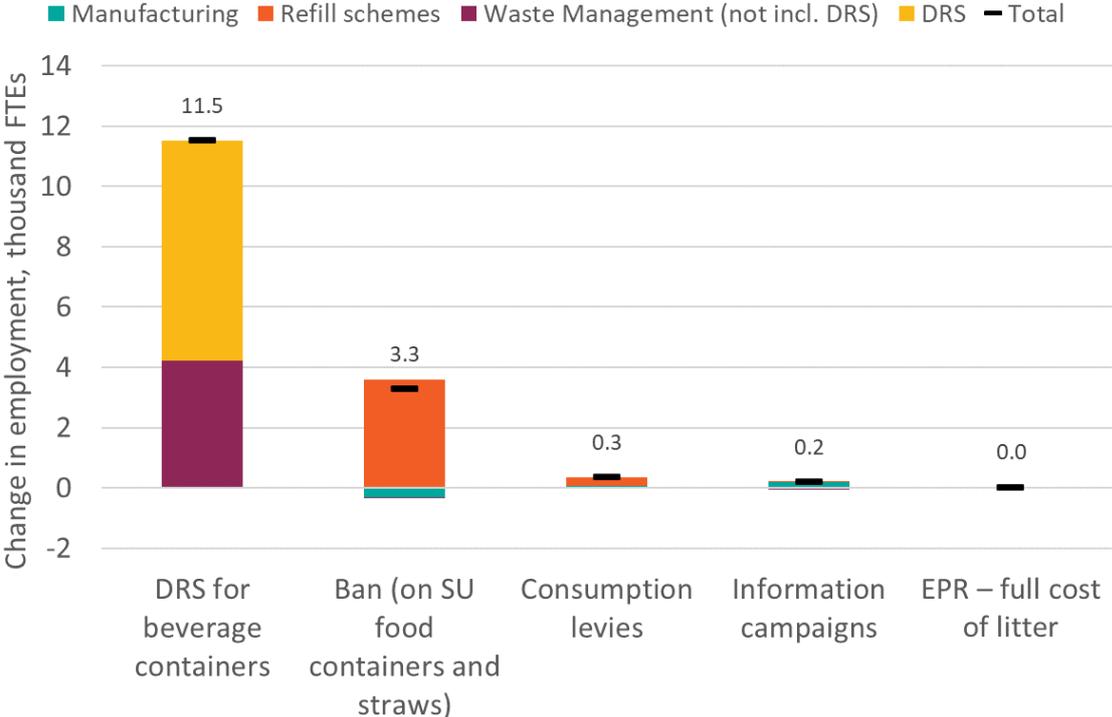
The modelling also assumes that public authorities will bear the cost of running information campaigns, which is modelled at approximately €59 million per annum.

7.3 Social

In terms of social impacts one of the key impacts of measures targeting litter (primarily DRS and EPR) will be that of litter on beaches. As litter marine and beach litter reduce increase social welfare will be derived. For example, given the association of littered environments with crime, and the fear of crime (and other anti-social activities), any reduction in litter is likely to lead to wider social benefits and improve overall levels of societal wellbeing. This is described further in the annex to the impact assessment of the SUP Directive, and for further description of this data please refer to the Annex of the report for this study.

Impacts on jobs are also modelled in this study, and are presented in Figure 5. As discussed in Section 6.3, these do not include any potential loss of informal sector jobs as waste management is formalised and/or estimates of the amount of informal sector workers that could be partially or fully formalised, due to a lack of available data on informal sector employment. Our modelling also does not include any reduction in municipal waste collection jobs as a result of the implementing a DRS and the resulting decrease in waste collected through municipal services. However, experience of DRS systems demonstrates that, on the whole, this decrease is fairly minimal, as removing only one material stream (beverage bottles) does not have a significant impact on the total volume of waste collected (and therefore the number of trucks / rounds / staff required).

Figure 5: Change in Employment, Thousand FTEs



DRS schemes have the most significant positive impact on employment, with an estimated 11.5 thousand jobs created. Over half these jobs are associated with the running of the scheme, including collections of DRS material, additional staff required by retailers (who are effectively reimbursed through handling fees), haulage, administration and counting centres. Significant jobs are also created through the additional requirements for plastic reprocessing capacity, which could be both at newly constructed domestic recycling facilities or abroad if material is exported.

Approximately 3.3 thousand net jobs are created through bans on single use food container and straws. This is due to the implementation of refillable take-away box schemes for food containers, as they require reasonably significant numbers of staff to operate them, in relation to collection and washing. This increase in jobs significantly offsets reductions in manufacturing jobs due to decreased net consumption.

8.0 Recommendations for Policy Guidelines

8.1 Improving waste collection/ separation is pivotal – particularly along coastal areas and waterways

It is proposed that the EPR system for packaging could be significantly improved if the existing requirement for all producers to register with a PRO and contribute fees was (better) enforced (including for importers), including for all forms of packaging (primary, secondary and tertiary). Particular actions should be taken to reduce the amount of free-riding of the system that currently takes place.

In addition, the development of optimal waste collection systems should not be constrained by the funds made available by producers – conversely, the fees charged to producers should be determined on the basis of the necessary costs required to deliver a well-functioning waste collection, transport, and treatment system, which should be determined by municipalities. Such improvements in waste service delivery should be accompanied by consumer awareness programmes, as well as incentives to ensure correct waste separation by households: penalties/ fines for repeated offences related to contamination of recyclables/ lack of separation, pay as you throw schemes.

Whilst EPR provides for better infrastructure (i.e. pays for separate collection and reprocessing), it does not guarantee high collection rates, as demonstrated by packaging collection systems in the EU that do not utilise DRS. DRS offers both an incentive for people to take packaging to a collection point, and also guarantees (if implemented correctly) very pure material streams (e.g. uncontaminated food grade plastic bottles) that can then enter closed loop recycling systems.

For those countries, that have not yet implemented any form of EPR scheme for packaging, the design of an EPR scheme should be carried out carefully, taking into consideration the relevant actors, the legal and financial responsibilities (full cost coverage) as well as the monitoring and communication awareness raising relevant activities.

8.2 The use of Bans and levies to Maximise Effect

It is noted that while bans are a common intervention aiming to reduce the use of, and pollution from, SUP products in countries around the world, there is a widespread evidence-gap on their effectiveness. There are significant differences in their impacts which are correlated to a number of variables including implementation and enforcement. There is no scope for raising any revenue through bans, with the exception of financial penalties for offending organisations. However, there could be significant costs of the ban arising through its implementation and enforcement. These might be

direct costs such as policing and indirect costs such as the loss of jobs. However, the impact assessment of the EU SUP Directive found that overall net benefits would be generated from the specific bans included in the Directive.

The implementation of SUP bans alongside a system of levies to nudge consumer behaviour towards preferred alternatives can mitigate against some of the risks associated with bans, such as a move to other single use alternatives that are subject to littering, and potentially cause problems for existing waste management processes.

A risk is thus that where, for example, single-use plastic straws, stirrers and cutlery are banned, they might be replaced on a one-for-one basis with single-use non-plastic (SUNP) alternatives such as wooden stirrers and cutlery, or paper straws, which have negative environmental impacts of their own. Therefore it would be preferable from an environmental perspective to ensure that alongside the ban on single-use plastics items, single-use non-plastic items are not available for free at the point of sale.

Levies can also be introduced in a phased, flexible manner (as has been the case with carrier bag charges in EU and other non-EU countries), to ensure incremental impact over time and responsiveness to wider economic considerations.

Implementing a charge on the above-mentioned non-plastic single-use alternatives would provide an incentive for waste prevention through either avoiding the use of e.g. straws altogether, or using reusable alternatives such as metal spoons in place of stirrers.

An important further point is that a levy will align the interests of the retailer with those of the Government in seeking to reduce consumption. Taking single-use coffee cups as an example, a charge that encourages customers to bring their own will mean the retailer saves money for each disposable cup they are not required to 'give away'. In some places, smaller retailers are able to keep the proceeds of the charge, which could offset the cost of providing the disposable cup for those who do not switch to a reusable cup. This means that the greater the reduction, the greater the benefit to the retailer (plus the consumer should ultimately see a reduction in the price of the coffee as cost of the 'free' disposable cup provided would have been covered by the overall cost). By contrast, where certain SUP items are banned, apparent single-use alternatives (that may not be covered by a ban in some cases), such as biodegradable or compostable cups are often more expensive, meaning that the ban would lead to a negative financial impact for the retailer, as well as for waste management systems that are likely to struggle to manage such waste streams

8.3 Ensure Implementation of DRS for Beverage Containers

The impact of a DRS depends on how well it is designed – a well-designed scheme can have significant benefits in the form of increased recycling rates, reduced littering of deposit-bearing containers, a reliable supply of high-quality recycled material, reduced greenhouse gas emissions and air pollutants; and increased employment.

The most effective systems are run by the beverage industry as a form of producer responsibility, with a minimal role for the Government. In many cases, the Government legislates to require a deposit to be charged on certain beverage containers and sets a minimum recycling target but the remaining details are left to the system operator to determine.

When introducing a DRS, the industry must be given time to agree on the selected design, to put in place the necessary systems, infrastructure and people, and to change the container labels to incorporate the deposit logo. It is also important to communicate the benefits to producers, particularly in terms of the positive reputational image and increased supply of material for new containers. Time is similarly needed to communicate with consumers, both the reasons for introducing the DRS, the benefits it will bring for the country and how they can claim a full refund on the deposit.

8.4 Implement Nationwide Potable Water/ Refill Systems

In order to reduce the consumption, waste and litter associated with on-the-go single use plastic bottles, particularly during the tourist season, this measure proposes nationwide expansion of existing programmes that focus on the development of refill networks and access to public drinking water, such as water fountains. On a larger scale, this includes improvements in existing potable water systems to eliminate the need for plastic water bottles for domestic consumption. This is particularly relevant on Greece's islands, where the installation of small-scale community desalination plants in cooperation with bottlers can have significant results, as has been the case in Lipsi municipality.¹²⁵

Literature does suggest some of the key elements of such programmes that increase their uptake. For example, a study was undertaken to compare consumer attitudes towards tapped water in Riga, Latvia where there are issues with water quality, and Nicosia, Cyprus where continuity of supply is an issue. This study found that for the most part, reliability of supply takes precedence over water quality, but when reliability is no longer in question, quality becomes the most important factor in determining uptake of a potable water system.¹²⁶

This suggests that the installation of fully functioning and properly maintained potable water supply systems that provide a reliable and clean supply of water, considering including water minerals, supplemented by information campaigns that highlight the quality of the water, will ensure the greatest uptake. Similarly, refill programmes are likely to be successful when networks are widespread and reliable, and where effective

¹²⁵ <https://www.newgreektv.com/news-in-english-for-greeks/greece/item/25961-lipsi-is-the-first-city-in-greece-to-remove-plastic-bottles>

¹²⁶ Chenoweth, J., Barnett, J., Capelos, T., Fife-Schaw, C., and Kelay, T. (2010) Comparison of Consumer Attitudes Between Cyprus and Latvia: An Evaluation of Effect of Setting on Consumer Preferences in the Water Industry, *Water Resources Management*, Vol.24, No.15, pp.4339–4358

signposting of refill locations exists, through the use of apps or window signs for instance.

It is noted that the impacts of such measures are likely to be most significant for bottlers and retailers, who will experience reduced sales of bottled water. For retailers, this may be offset by the increased customer footfall associated with participating in refill schemes. Additionally, costs to municipalities will increase, associated with the improvement and maintenance of public water and potable water systems – though such costs may be passed on to consumers in the form of tariffs. Finally, it is noted that these measures will impact the consumption of plastic water bottles only – plastic bottle consumption for soft drinks, etc. is unlikely to be impacted, though incentivising the uptake of soft drink refill stations and technologies like sodastream¹²⁷ for households may change this.

8.5 Improve data availability and data collection

The issue of inadequate data availability and accuracy, particularly for packaging waste, is one that is widely recognised.

This measure, therefore, proposes the development of a national packaging registry focussed on gathering the evidence required to monitor and enforce compliance with packaging regulations and targets related to recycling, reuse and recycled content use. Such a registry should be harmonised with the information gathered by EPR schemes to prevent duplication of effort (packaging quantities, weight, material composition). Producers could additionally be required to provide information (potentially through self-certification in order to reduce administrative burden) on the specific types and formats of packaging being placed on the market, their chemical composition/ use of hazardous content, the use of recycled content, the current rate of recycling for each, and reusability.

In order to maximise the impact that could be associated with this measure, particularly in the case of self-certification of compliance against these criteria, producers should be required to supply all the necessary evidence of compliance to enable third-party auditing in order to validate the information. Auditing should be undertaken rigorously and against set targets (e.g. each company at least once every 5 years) and minimum penalties for non-compliance should be outlined and enforced strictly. Finally, non commercially-sensitive information on packaging could be made publicly available, not only to enhance producer accountability, but also to spread awareness among consumers regarding the types of packaging they use. This would also encourage scrutiny of the market and policies by academic, community and not-for-profit institutions, enhancing transparency in the legislative process. The costs associated with

¹²⁷ <https://sodastream.co.uk/>

the maintenance of such a registry at the national level could be offset by an annual registration fee charged to producers at the time of registration.

Evidence also suggests significant issues in regards to the data on production, consumption and waste management and general poor record keeping by users resulting in poor data inputs and hence dubious quality and effectiveness as a mechanism for supporting product and waste data transparency and traceability. Therefore, there is need to ensure that spot checks/annual surveys and regular audits are taking place, better enforcement to ensure coverage, and better-quality data (this might include improved guidelines for users, improved system of data verification, mass balance calculations etc).

Marine litter monitoring, such as beach litter counts should be considered but there are some limitations. It's easier to measure production and consumption of SUP items and to some extent easier to measure terrestrial litter (as more likely to have been influenced by policy and legislation). If there is existing marine litter monitoring, closer examination of the items (i.e. counts) is recommended in any given country.

8.6 Maximise Sorting of Plastics from Residual Waste prior to Landfill/ Recovery

While other proposed measures to improve the packaging EPR scheme, where available, and associated household waste separate collection system are likely to be the most significant in boosting recycling rates, there is a need for further extraction of recyclable materials from the mixed/ residual waste stream prior to disposal/ recovery as well.

Considering high reliance on landfill, with respect to the average of EU Member States, priority should be given to ensuring maximum recycling rates in the existing and planned waste treatment (e.g. MBTs) /recycling infrastructure in those countries with the aim of reducing residues (and plastics) to landfill. In particular, in line with the Circular Economy context, options higher in the waste hierarchy such as recycling of plastics versus recovery/disposal should be prioritized.

Thus, considering most suitable treatment processes, for example, maximizing 'sorting' in waste treatment facilities through advanced sorting technologies (e.g. infrared, x-ray, machine learning etc.) would consequently result in lower plastic content of the outputs/ residues. However, it is important to consider the quality and market price of recycled plastics as well as of the available outlets in the country for the recyclates produced, otherwise there is a risk that recycled plastics of low quality/ price may be stockpiled and/or subsequently disposed of.

8.7 Observations on the SUP Directive

Addressing plastic items

One obvious point to highlight is that the Directive only addresses plastic items. This focus is arguably a weakness, as it may be seen to suggest that the problem is 'plastic' rather than 'single-use'. From a resource efficiency and climate change perspective, alternatives to plastic such as paper, glass and metal all have their own impacts, and even when it comes to litter, non-plastic items can cause significant visual disamenity and other impacts. Glass bottles can break and thus pose a risk of injury to passers-by, while metal cans can tear and expose sharp edges which can also pose the risk of injury to people and also livestock.

Consumption Reduction

In addition, concerning a measure on consumption reduction, there is no quantitative target provided under Article 4 of the SUP Directive (EU) 2019/904, therefore no actual target set at the EU-level.

Article 4(1) goes on to state that:

The measures may include national consumption reduction targets, measures ensuring that re-usable alternatives to the single-use plastic products listed in Part A of the Annex are made available at the point of sale to the final consumer, economic instruments such as instruments ensuring that those single-use plastic products are not provided free of charge at the point of sale to the final consumer and agreements as referred to in Article 17(3).

Of these options, experience with Member State responses to the Carrier Bags Directive suggests that ensuring that these SUP items are not provided for free to the final consumer at the point of sale would have the greatest waste prevention potential. The magnitude of the effect would, of course, depend on the level of the consumer-facing tax or charge, but on the basis that the level can be adjusted upwards as necessary, such an approach could be adapted as the price-responsiveness became clear. In addition, a charge in the form of tax would enable to observe the change in consumption levels, via effective data collection.

Broadening Scope

Finally, one legislative Act in any given country could cover one or more Single Use items (in terms of bans, levies etc.) so that the government can have the power to act on more than one. Broadening the scope and covering a range of SU items not just limit on plastics, is one to consider for countries aiming to reduce both terrestrial and marine litter and improve waste management and recycling in the short, medium and longer term.

APPENDICES

A.1.0 National Data Reports

Summary results by country are presented in this section.

Table 21: Greece - Model Outputs (2030) – Option Comparison, Relative to Baseline

	Ban (of food containers and straws)	Consumption levies	DRS for beverage containers	EPR – full cost of litter	Information campaigns
Marine litter by count (as % of items in study)	-0.9%	-0.7%	-2.9%	-55%	-15%
Marine Litter, tonnes	-211	-70	-531	-439	-127
GHGs, thousand tonnes CO2e	-20	-5.9	-113	1.2	-23
External Costs, € million	-69	-19	-175	-141	-40
Costs to consumers, € million	-58	52	-	-	-56
Costs to retailers (reduced turnover), € million	58	8.5	-	-	56
Business compliance, commercial washing & refill scheme costs, € million	63	9.3	-	-	0.79
Costs to producers (reduced turnover + producer fees for DRS / EPR), € million	29	4.2	18	5.2	28
Waste management costs, € million	-0.49	0.08	-3.1	0.06	-0.14
Information campaign costs, € million	-	-	-	-	15
Additional tax revenue, € million	-	60	-	-	-
Employment, FTE	1,108	96	919	0.61	-105

Table 22: Egypt - Model Outputs (2030) – Option Comparison, Relative to Baseline

	Ban (of food containers and straws)	Consumption levies	DRS for beverage containers	EPR – full cost of litter	Information campaigns
Marine litter by count (as % of items in study)	-0.9%	-0.7%	-2.9%	-55%	-15%
Marine Litter, tonnes	-456	-148	-10,908	-7,041	-2,040
GHGs, thousand tonnes CO2e	-11	-0.34	-401	0.23	-113
External Costs, € million	-72	-21	-1,705	-1,091	-316
Costs to consumers, € million	-26	82	-	-	73
Costs to retailers (reduced turnover), € million	26	-10	-	-	-73
Business compliance, commercial washing & refill scheme costs, € million	81	58	-	-	1.0
Costs to producers (reduced turnover + producer fees for DRS / EPR), € million	13	-5.0	137	84	-37
Waste management costs, € million	-0.27	0.16	-11	0.47	-1.1
Information campaign costs, € million	-	-	-	-	35
Additional tax revenue, € million	-	72	-	-	-
Employment, FTE	1,559	180	7,969	9.9	242

Table 23: Montenegro - Model Outputs (2030) – Option Comparison, Relative to Baseline

	Ban (of food containers and straws)	Consumption levies	DRS for beverage containers	EPR – full cost of litter	Information campaigns
Marine litter by count (as % of items in study)	-0.9%	-0.7%	-2.9%	-55%	-15%
Marine Litter, tonnes	-6.1	-1.9	-20	-15	-4.5
GHGs, thousand tonnes CO2e	-0.46	-0.001	-3.5	0.0001	-0.9
External Costs, € million	-2.5	-0.47	-8.0	-6.2	-1.7
Costs to consumers, € million	-0.89	3.7	-	-	0.24
Costs to retailers (reduced turnover), € million	0.89	-0.61	-	-	-0.24
Business compliance, commercial washing & refill scheme costs, € million	3.7	0.54	-	-	0.05
Costs to producers (reduced turnover + producer fees for DRS / EPR), € million	0.45	-0.30	1.0	0.18	-0.12
Waste management costs, € million	-0.014	0.007	-0.11	0.001	-0.002
Information campaign costs, € million	-	-	-	-	0.47
Additional tax revenue, € million	-	3.1	-	-	-
Employment, FTE	73	8.5	57	0.02	1.9

Table 24: Morocco - Model Outputs (2030) – Option Comparison, Relative to Baseline

	Ban (of food containers and straws)	Consumption levies	DRS for beverage containers	EPR – full cost of litter	Information campaigns
Marine litter by count (as % of items in study)	-0.9%	-0.7%	-2.9%	-55%	-15%
Marine Litter, tonnes	-166	-54	-4,076	-2,604	-755
GHGs, thousand tonnes CO2e	-4.1	-0.08	-100	0.002	-25
External Costs, € million	-15	-4.4	-374	-236	-69
Costs to consumers, € million	-23	25	-	-	12
Costs to retailers (reduced turnover), € million	23	1.4	-	-	-12
Business compliance, commercial washing & refill scheme costs, € million	29	8.7	-	-	0.37
Costs to producers (reduced turnover + producer fees for DRS / EPR), € million	11	0.69	30	31	-6.0
Waste management costs, € million	-0.02	0.06	-0.56	0.04	-0.06
Information campaign costs, € million	-	-	-	-	8.2
Additional tax revenue, € million	-	26	-	-	-
Employment, FTE	527	51	2,557	3.6	41

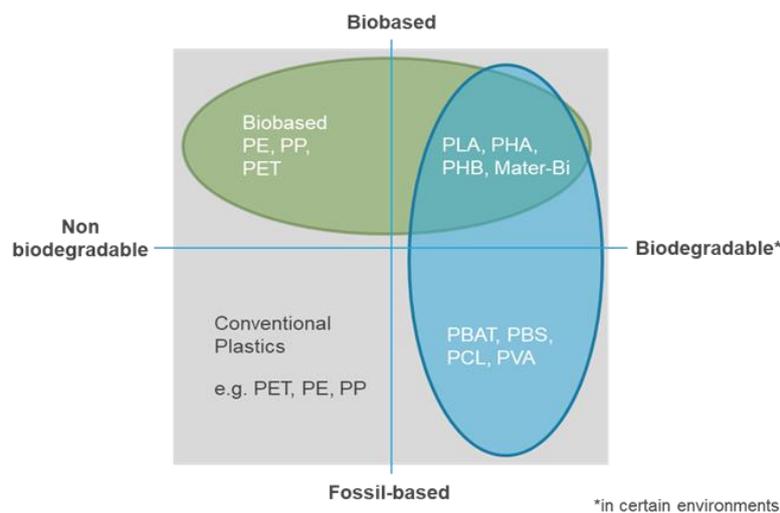
A.2.0 Bio-based, Biodegradable and Compostable Plastics

There are a number of materials which technically and functionally perform as plastics, though are distinguished based on their source material (bio-based as opposed to fossil-based) or biodegradability. The term 'bioplastic' is often used to cover bio-based and biodegradable plastics. However, this term is confusing as it covers a range of different types of material, even fossil-based material. For clarity, the term 'bioplastic' can be split into the following three groups of plastic:

- Biodegradable bio-based;
- Biodegradable fossil-based; and
- Non-biodegradable bio-based.

Figure 6 shows an overview of plastic types, the origin of their material and the biodegradability.

Figure 6: Overview of plastic types



Raw materials for bio-based plastics come from forestry, agriculture, residues, bio-waste and other sources. This includes timber, cassava, plant oils, fructose, maize, sugar cane/beet, corn, potato, wheat and algae. Currently, 0.016 % of global agricultural areas are used to grow bio-based and biodegradable plastic feedstocks.

Bio-based Plastics

Bio-based plastics are plastic materials which are derived from plant-based sources, as described above. Plastics which are 'bio-based' may have mixed proportions of fossil and plant-based materials, rather than being entirely plant-based. Bio-based plastics include PLA (polylactic acid), PHAs (polyhydroxyalkanoate), starch blends and bio-PBS(A) (polybutylene succinate).

Bio-based plastics can be further categorised as drop-in or novel plastics. 'Drop-in' bio-based plastics are so called because of their ability to be exchanged directly with their fossil-based counterpart (e.g. bio-PET). On the other hand, there are completely novel bio-based plastics with a chemical structure like no other, for example PLA and PEF (polyethylenefuranoate).

While bio-based plastics are derived (primarily in-part) from plant-based sources, the chemical process creates polymers that can be identical to conventional plastics. This means that just because plastics are bio-based, does not mean that they are biodegradable. For example, as shown in Figure 1, bio-based PET does not biodegrade.

Biodegradable Plastics

Biodegradable plastic can be defined as "A degradable material in which the degradation results from the action of microorganisms and ultimately the material is converted to water, carbon dioxide and/or methane and a new cell biomass."

Some biodegradable plastics may biodegrade very quickly in one environment but not in others. It is therefore very important to define timeframe and environment when talking about biodegradation. The term 'biodegradable' has little or no meaning without a clear specification of the exact environmental conditions that this process is expected to occur in.

The rate of decomposition is affected by the presence of bacteria, fungi and oxygen; hence a 'biodegradable' material may decompose in industrial composting conditions, but not (or at a considerably slower rate) in landfills, on land or in the marine environment.

Compostable Plastics

'Composting' is defined by the European Commission as enhanced biodegradation under managed conditions, predominantly characterised by forced aeration (in the presence of oxygen) and natural heat production resulting from the biological activity taking place inside the material. The term 'compostable plastic' refers to a material that can biodegrade in an industrial composting facility but not necessarily in a home composting environment, in the ocean or in any other natural environments. These will be made from bio-based plastics.

Industrial composting and anaerobic degradation are the only environments that have been subject to international standards for biodegradation, in the form of the European Standard EN 13432 for plastic packaging and EN 14995 for other plastic items. This is primarily because a test can be developed that simulates some industrial composting and AD facilities. However, there is scepticism towards these standards and the methods used to determine the requirements as some have argued that it is not possible to recreate these environments. Industrial composting and AD processes vary from place to place.

A.2.1 End-of-life Considerations for Alternative Plastics

A.2.1.1 Collection

The increased use of “biodegradable” plastics has led to considerable confusion for consumers regarding the correct end of life disposal options for packaging made of such materials. This results in contamination of the organic waste stream when conventional/ non-compostable plastics are wrongly mixed with the stream, and conversely, has also led to contamination of the plastic recycling stream when compostable plastics have wrongly been disposed of here. In both cases, the contamination results in increased costs associated with decontamination, and in some cases, leads to the rejection of entire loads of recyclable/ compostable materials due to quality issues.

A more concerning issue is the misconception that packaging that meets biodegradability standards (such as EN 13432) will degrade in natural environments, leading to the misconception among consumers, and in some cases, the adoption of misleading labelling by producers, suggesting that such packaging can be littered in the environment (whether on land or in water) and will cause no damage. This is not the case, as the biodegradability standard does not refer to degradability of packaging in natural conditions, but rather in test conditions that are unlikely to be replicated in nature. Therefore, biodegradable, compostable, and bio-based plastic packaging is not guaranteed to degrade in the natural environment, and can therefore cause the same environmental damage in these environments as conventional plastics. As the use of such materials increase, given the misconceptions about the degradability of bioplastics at present, they are likely to pose an even greater problem than plastics in some cases.

A.2.1.2 Treatment

There is a range of problems tied to the use of biodegradable and compostable items in the waste management systems that do include organic treatment. If mixed in with food waste, this is most likely sent to treatment plants for biogas production or to industrial composting. As contamination levels are often high, due to incorrect sorting and the use of bags to collect food waste, a pre-treatment process is usually in place to remove all contaminations before the food waste enters both biogas plants and industrial composting plants. Regardless of what material the bag is made of, or whether a product is biodegradable or compostable, or made from fossil resources, the objects will be removed in the pre-treatment process.

In this pre-treatment process the bags are ripped open and shredded and the removal of the entire bag, and other contaminants, is challenging. Some particles will follow the process and mix in with the final product (digestate or compost). Leftover plastics that are not removed can cause mechanical trouble to the equipment used in the plant, but also to the equipment used in agriculture when using the digestate or compost. Microplastics have become a severe challenge and there is a high risk that food waste

bags and contaminations will give rise to microplastics in the digestate. Some plastics are biodegradable and will degrade over time.

On the other hand, certain bio-based materials can produce common fossil plastic types like PE, PP and PET, which are fully recyclable. These drop-in bio-based plastics are easier to process in existing manufacturing and recycling systems as they are identical to their fossil-based counterparts. Newer bio-based plastics, such as PLA, cannot be recycled together with conventional plastics as existing sorting plants are set to accept fossil-based plastics and do not have separate streams for the newer bio-based plastics. Depending on the sorting technology in place, PLA will therefore either get sorted out of the recycling stream and go to incineration or landfill, or head for recycling. If it does end up entering the recycling process, PLA will cause interference by contaminating the rest of the fossil-based material resulting in lower quality of recyclate, or rejection of the entire load.

It is noted here that the recognised standard for the biodegradability of packaging products in the EU, EN 13432, covers their degradability in industrial treatment plants, both industrial composting and biogas plants. Although some products are certified as compostable as per EN 13432, it is not guaranteed that they will degrade in all composting and biogas plants as the treatment period does not match the criteria of the test method. The test conditions used for certification of biodegradability of packaging products are not comparable to real life conditions in most plants. The pre-treatment process in place at these industrial plants will also remove waste bags and other contaminations to the food waste, including biodegradable and compostable products.

A.3.0 Good Practice Case Studies

A.3.1 Germany: Ban on disposable drinks containers

Overview: In 1991, the City of Munich introduced a ban on the use of disposable cutlery and crockery at large-scale public events which take place on land and retail spaces owned by the city. Event organisers use reusable items which are made available using a deposit-refund system. The deposit is generally only applied to cups, bottles and plates. Abfallwirtschaftsbetrieb München (AWM), the municipal company for waste management, is responsible for enforcement of the obligation.

The ban covers disposable food and drink containers, including: paper plates, plastic cups, plastic forks and knives; and packaging, including: single-use cans, plastic or glass bottles. Exemptions can be requested, and are generally associated with health and safety issues, such as at sporting events.

Implementation: The rental of dishwashers and reusable dishes, including transport and set-up, is a service provided both by the city and private firms. Some firms rent items which are returned and centrally cleaned, while others rent mobile dishwashers. The ban has been enforced through a by-law, violation of which is punishable with a fine. Enforcement is undertaken through random event visits. During 2010 for instance, AWM monitored 20 events, of which nine led to subsequent letters and two were followed up with penalty proceedings. One of these fines was for the maximum amount of €2,500 and the other was repealed in court due to the low income of the event promoter.¹²⁸

Impact: Overall waste generated by events decreased by 50% between 1990 and 2004, and the amount of unsegregated waste (i.e. residual waste) fell by 75%. At the Oktoberfest event for instance, waste generation decreased from 11,000 tonnes in 1990 to 550 tonnes in 1999.¹²⁹ One lesson learned is that a focus on large scale events is more appropriate than small events because they usually generate more waste and the service is more cost-effective.¹³⁰

¹²⁸ Pre-Waste (2012) *Ban on disposable food and drink containers at events in Munich, Germany*, accessed 15 July 2020, <http://www.prewaste.eu/waste-prevention-good-practices/detailed-factsheets/item/255-099-ban-disposable-tableware-cups-germany.html>

¹²⁹ Pre-Waste (2012) *Ban on disposable food and drink containers at events in Munich, Germany*, accessed 15 July 2020, <http://www.prewaste.eu/waste-prevention-good-practices/detailed-factsheets/item/255-099-ban-disposable-tableware-cups-germany.html>

¹³⁰ Pre-Waste (2012) *Ban on disposable food and drink containers at events in Munich, Germany*, accessed 15 July 2020, <http://www.prewaste.eu/waste-prevention-good-practices/detailed-factsheets/item/255-099-ban-disposable-tableware-cups-germany.html>

A.3.2 Norway: Deposit Return Scheme (DRS)

Overview: The principle of a DRS is that the consumer pays a deposit at the point of purchase, which can be redeemed when they return their used beverage container. It is a financial incentive to improve the collection and recycling of containers within the scheme.

Since 1999, a national deposit and recycling system for non-refillable plastic beverage bottles and cans has been operated by Infinitum in Norway. Infinitum is a non-profit organization owned by Norwegian bottlers and retailers.

Implementation: The Norwegian Government imposes an excise duty per unit of single-use beverage packaging placed on the market. The tax is composed of a base tax and an environmental tax.¹³¹ It is set at a relatively high level and declines once a 25% collection rate is achieved. It drops to zero once a 95% collection rate is achieved. In response to this incentive, industry collectively decided that the most cost-effective option was to establish a DRS.

Products covered by the scheme are identified with a deposit logo and barcode. Deposit values range from NOK 2 for ≤ 0.5 litres and NOK 3 for > 0.5 litres (€0.19-€0.28). There are approximately 12,000 return locations with 3,700 Reverse Vending Machines (RVM); the vast majority of retailers provide a manual return service. A handling fee is paid to retailers for taking back used containers.

The scheme is funded by producers, material revenues and unredeemed deposits. Producers who are part of the scheme must report to Infinitum every month. Those producers who do not sign up to the Infinitum scheme pay a fixed environmental fee per can/bottle under Norwegian law.

Impact: In 2018, the recovery rate 87-88% returned to RVMs.¹³² The high return rates demonstrate the public acceptance of the DRS, and that returning bottles is now considered a “norm”. Cooperation between stakeholders throughout the value chain has been key to the success of the scheme.¹³³

A.3.3 Denmark: Water Fountains

Overview: 65 drinking fountains have been distributed throughout Copenhagen on streets, in parks, playgrounds or tourist attractions. The fountains were installed by

¹³¹ Infinitum *The environmental tax system*, accessed 16 July 2020, <https://infinitum.no/english/the-environmental-tax-system>

¹³² Infinitum (2019) *Infinitum Annual report 2019*, accessed 16 July 2020, <https://infinitum.no/english/infinitum-annual-report-2019>

¹³³ Infinitum (2019) *Infinitum Annual report 2019*, accessed 16 July 2020, <https://infinitum.no/english/infinitum-annual-report-2019>

HOFOR, the utilities company. The installations encourage the use of refillable bottles and the reduction in single-use water bottles.

Implementation: Many of the fountains only operate during the summer, although some are frost-proof and supply water all year round. The drinking fountains have been designed to ensure hygiene and accessibility, including for children. HOFOR checks the quality of the water every day and provides a map of all the water fountains on its website.¹³⁴

A.3.4 UK: Refill Initiative

Overview: Refill is an award-winning campaign, from City to Sea to help people live with less plastic. Refill launched the Refill campaign as a pilot in Bristol in 2015 and they are now an award-winning global movement with over 400 grassroots Refill Schemes in the UK and delivery partners around the world from Australia to Japan.

They have prevented more than 100 million plastic bottles from entering the waste stream and created a new social norm for refilling on the go. They acknowledge the problem is bigger than just plastic bottles. So, in 2020 they expanded the campaign to include refills of coffee, lunches, groceries and cleaning products.

Implementation: Refill helps reduce plastic pollution at source by making it easier to reuse and refill your bottle with free tap water rather than buy a new one. The Refill app is used to find local Refill Stations that welcome passers-by to top up their water bottles. Refill partners with Chilly's Bottles who not only sell our co-branded bottles but also make a donation to Refill for every bottle sold.

Impact: There are now over 400 Refill Schemes across the UK. There are now 30,000 Refill Stations on the app in the UK alone – including railway stations, airports and high street chains such as Costa, Pret and Wetherspoons. In 2018 they reached 33 million with their first National Refill Day and in 2019 they more than doubled that reaching over 70 million. Refill won Gold for 'Best Environmental Behaviour Change' at the Global Good Awards in 2018.

A.3.5 Antigua and Barbuda: EPS Container Ban

Overview: In January 2016 Antigua and Barbuda prohibited the importation, manufacturing and trading of plastic bags with distribution at the point of sale banned in July of the same year. This ban was followed by a ban on EPS foam food service

¹³⁴ HOFOR *Free drinking water in Copenhagen*, accessed 15 July 2020, <https://www.hofor.dk/english/knowledge-downloads/water-supply/free-drinking-water-in-copenhagen/>

containers in 2017, including clamshell and hinge containers, hot dog containers, bowls, plates, and hot and cold beverage cups. Since January 2018, single-use plastic utensils were banned, as well as food trays and egg cartons. In the future, styrofoam coolers are also expected to be banned.¹³⁵

The ban extends to all businesses within the food service industry, including large and small supermarkets, grocers and the catering sector. At present, airline carriers, private charters and cruise liners are exempt from the ban.

Implementation: The government integrated the ban into the country's existing Litter Control and Prevention Act.¹³⁶ In order to ensure engagement and acceptance of the policy, there were four rounds of stakeholder consultations including with major retailers, the National Solid Waste Management Authority and the Ministry of Trade and the Department of Environment. The ban was also preceded with public consultations and awareness raising campaigns.

Existing stocks were permitted to be drawn down over an initial period of six months, following which monitoring and confiscation of prohibited items became effective. An 'Open house' event was held showcasing the alternatives to styrofoam products, to allow exploration of options and networking. Moreover, the legislation includes a list of materials such as sugar cane, bamboo, paper and potato starch which will remain tax free.

Both the ban, and the alternatives that were available for businesses to switch to, were publicised during the transitional implementation. Publicising the ban took many forms, including formal announcements via the environment department, through Facebook and through engagement with stakeholders.¹³⁷

Impact: In the first year the ban contributed to a 15.1% reduction in plastic discarded to landfill.¹³⁸

¹³⁵ UNEP (2018) *Single-Use Plastics. A Roadmap for Sustainability*, accessed 10 September 2018, https://wedocs.unep.org/bitstream/handle/20.500.11822/25496/singleUsePlastic_sustainability.pdf?sequence=1&isAllowed=y

¹³⁶ Mendes-Franco, J. (2020) *Is there more to the Caribbean's single-use plastics ban than meets the eye?*, accessed 15 July 2020, <https://www.caribbeannewsglobal.com/is-there-more-to-the-caribbeans-single-use-plastics-ban-than-meets-the-eye/>

¹³⁷ Government of Antigua and Barbuda (2017) *United Nations Conference to Support the Implementation of Sustainable Development Goal 14: Antigua and Barbuda, 2017*, https://sustainabledevelopment.un.org/content/documents/24496Antigua_Barbuda_E.pdf

¹³⁸ Government of Antigua and Barbuda (2017) *United Nations Conference to Support the Implementation of Sustainable Development Goal 14: Antigua and Barbuda, 2017*, https://sustainabledevelopment.un.org/content/documents/24496Antigua_Barbuda_E.pdf

A.3.6 Egypt: Red Sea governorate single-use plastics ban

Overview: In June 2019, the Governor Ahmed Abdullah adopted a decision banning single-use and disposable plastics in the Red Sea governorate. Plastic bags are meant to be banned in food shops, restaurants, supermarkets, grocery stores and pharmacies. All single-use plastics including plastic cutlery, straws and cups are banned from the Red Sea Governorate's restaurants and cruise ships.¹³⁹

Implementation: Awareness campaigns were gradually implemented through partnerships with civil society, sports clubs, schools and during Friday prayers in mosques. In order to encourage alternatives, 15,000 reusable bags were distributed to government employees and at public spaces such as local markets and mosques. Fines for continued use of plastic are also proposed.

The Governor issued instructions to form joint committees involving the General Administration for Environmental Affairs, the Protected Areas and Catering Sector, the Utilities Police, the Dive and Health Chamber, and the Environmental Police¹⁴⁰

Furthermore, in the Siva Grand Beach hotel for instance, plastic cutlery was replaced with wooden spoons and paper straws. Plastic chairs have also been replaced with bamboo chairs and biodegradable plastic bags are used in waste bins. Plastic shampoo and shower gel containers have also been phased out and honey and jam at buffets are now served in glass jars rather than individual plastic containers.¹⁴¹

Impact: Dahab, a South Sinai tourist city has since followed the lead of the Red Sea governorate. The city launched an initiative to prevent the use of plastic, under a 'No Plastic' campaign. Additionally, in 2019, the South Sinai governorate also announced a single-use plastics ban from March 2020. The South Sinai governorate decree further prohibits the use of single-use plastic utensils (forks, knives, spoons, plates, cups, and straws) used for food and beverage purposes on tourist boats within the South Sinai governorate.¹⁴² The South Sinai reserves have organised a number of training courses for hotel workers and tourist resorts to raise awareness of marine plastic pollution, including the 'let the sea breathe' initiative in hotels and resorts.¹⁴³

¹³⁹ Maged, M. (2019) *Red Sea Governorate bans plastics*, accessed 15 July 2020, <https://egyptindependent.com/red-sea-governorate-bans-plastics/>

¹⁴⁰ <http://www.redsea.gov.eg/new19/new.aspx?ID=154>

¹⁴¹ Nader, A. (2019) *How the Red Sea is Leading Egypt's Environmental Action*, accessed 15 July 2020, <https://egyptianstreets.com/2019/07/12/how-the-red-sea-is-leading-egypts-environmental-action/>

¹⁴² Dive Magazine (2020) *South Sinai joins single use plastic ban*, accessed 16 July 2020, <http://divemagazine.co.uk/eco/8828-south-sinai-joins-single-use-plastic-ban>

¹⁴³ Egyptian Streets (2019) *Dahab Launches Initiatives to Become a Plastic-Free Zone*, accessed 15 July 2020, <https://egyptianstreets.com/2019/07/07/dahab-launches-initiatives-to-become-a-plastic-free-zone/>

A.4.0 Model Data

In addition to the baseline data set out in Section 4.0, the following tables summarise key input data updated for this study. The model also uses data from the original model built for the impact assessment of the SUP Directive, and for further description of this data please refer to the Annex of the report for this study.¹⁴⁴ In all cases for Greece, the data used in the SUP Directive model¹⁴⁵ has been used. For Montenegro, in some cases where no country specific data is available, the data used for Croatia in the SUP Directive model¹⁴⁶ has been used as a proxy.

Wherever possible, data published by local and national authorities has been used, with data from industry, or consultant reports, used where necessary. The reader should note that detailed statistical reporting of waste data in the countries in this study is still relatively undeveloped compared to, for example, many EU countries. This has necessitated the use of carefully considered estimates and assumptions for some data inputs and modelling parameters. These are noted, and wherever possible have been evidenced in reference to known data points.

Table 25 sets out the annual growth rate assumption for each item by country. These growth rates are used in the model to profile the consumption rate for each item by country to 2030.

¹⁴⁴ ICF and Eunomia (2018) *Assessment of measures to reduce marine litter from single use plastics*, Report for DG Environment, May 2018, https://ec.europa.eu/environment/waste/pdf/Study_sups.pdf

¹⁴⁵ ICF and Eunomia (2018) *Assessment of measures to reduce marine litter from single use plastics*, Report for DG Environment, May 2018, https://ec.europa.eu/environment/waste/pdf/Study_sups.pdf

¹⁴⁶ ICF and Eunomia (2018) *Assessment of measures to reduce marine litter from single use plastics*, Report for DG Environment, May 2018, https://ec.europa.eu/environment/waste/pdf/Study_sups.pdf

Table 25: Annual Growth Rate Assumptions

	Greece		Egypt		Montenegro		Morocco
Cigarettes	-7%	4%	20% compound annual growth rate over 5 years used to calculate a 4% annual growth rate. ¹	0%	No data provided by local expert therefore data for Croatia used as a proxy.	0%	0% growth rate provided by the local expert ⁴ .
Food containers	2%	2%	1.7% annual growth rate provided by local expert ² .	0%	No data provided by local expert therefore data for Croatia used as a proxy.	2%	No data provided by local expert therefore data for Egypt used as a proxy.
Straws	3%	10%	No value provided by the local expert. The value for drinks bottle annual growth rate in Egypt used as a conservative estimate.	0%	No data provided by local expert therefore data for Croatia used as a proxy.	9%	No value provided by the local expert. The value for drinks bottle annual growth rate in Morocco used as a conservative estimate.
Drinks bottles	2%	10%	100% growth by 2030 provided by the local expert equating to 10% annual growth rate ³ .	0%	No data provided by local expert. Assumption of 0% growth used as a conservative estimate.	9%	8.95% growth rate provided by local expert ⁵ .

1 - *The Tobacco Atlas / 2019, Eastern Company investor presentation / 2019*

2 – *No source provided by local expert*

3 - *World integrated trade solutions / 2018*

4 - Article "*Marché du tabac : Un secteur méconnu en mal de reconnaissance*" by LE MATIN, Abou Réda, December 2019
<https://lematin.ma/journal/2019/marche-tabac-secteur-meconnu-mal-reconnaissance/328698.html>

5 - *Etude de faisabilité : Système de collecte des bouteilles plastiques et des canettes // SUNOV ENGINEERING (Octobre - 2018).*

Table 26 sets out the data used for annual consumption of the modelled items in each country. Table 27 shows the year the consumption data in Table 26 relates to.

The consumption data displayed in Table 26 was cross examined using the ratios of consumption between the different SUP types for each country. These ratios were then compared between countries so any anomalous values could be flagged. The per capita consumption for each item in each country was also calculated and reviewed.

Table 26: Consumption Data - Annual Uses (millions)

	Greece	Egypt	Montenegro	Morocco
Cigarettes	30584	89070 Data provided by local expert ¹ .	1313 No data provided by local expert. The consumption rate calculated proportionally from the data from Croatia based on population size.	15000 Data provided by local expert ⁵ .
Food containers	132	413 No data provided by local expert. The consumption rate calculated proportionally from the data from Morocco based on population size.	18 Data provided by local expert on the units produced annually by stakeholders whose % market share is known ³ . The units produced annually by the stakeholder is scaled to calculate total units.	150 Data on the recycling rate % and tonnes of food containers recycled provided by local expert ⁶ . This information is used to calculate the total quantity consumed.
Straws	1043	406 No data provided by local expert. The consumption rate calculated proportionally from the data from Montenegro based on population size.	3 Data provided by local expert ⁴ .	149 No data provided by local expert. The consumption rate calculated proportionally from the data from Montenegro based on population size.
Drinks bottles	1412	5263 Data provided by local expert on consumption of drinks bottles in tones of PET ² . The average weight per unit of 38 grams used to calculate the number of bottles used each year.	76 No data provided by local expert. The consumption rate calculated proportionally from the data from Croatia based on population size.	1274 Data provided by local expert ⁷ .

1 - The Tobacco Atlas / 2019, Eastern Company investor presentation / 2019

2 - World integrated trade solutions / 2018

3 – Discussions between local expert and Micromedia and Tring.

4 – Discussions between local expert and PG-PAK.

5 - Article "Marché du tabac : Un secteur méconnu en mal de reconnaissance" by LE MATIN, Abou Réda, December 2019

<https://lematin.ma/journal/2019/marche-tabac-secteur-meconnu-mal-reconnaissance/328698.html>

6 - Proposition d'approche pour structurer la filière recyclage des matières plastiques, Ucotra consulting (October 2015)

7 - Etude de faisabilité : Système de collecte des bouteilles plastiques et des canettes // SUNOV ENGINEERING (Octobre - 2018).

Table 27: Latest Year of Consumption Data Assumptions

	Greece		Egypt		Montenegro		Morocco
Cigarettes	2015	2020	No year associated with the data provided by local expert in Table 26, therefore data assumed to be from the current year.	2015	Data for Croatia used which is from 2015.	2019	Data from local expert is from 2019 ³ .
Food containers	2016	2020	Data for Morocco used which is for 2020.	2018	Data from local expert is from 2018 ¹ .	2020	No year associated with the data provided by local expert in Table 20, therefore data assumed to be from the current year.
Straws	2016	2019	Data for Montenegro used which is for 2019.	2019	Data from local expert is from 2019 ² .	2019	Data for Montenegro used which is for 2019.
Drinks bottles	2016	2020	No year associated with the data provided by local expert in Table 20, therefore data assumed to be from the current year.	2016	Data for Croatia used which is from 2016.	2020	No year associated with the data provided by local expert in Table 20, therefore data assumed to be from the current year.

1 - Discussions between local expert and Micromedia and Tring.

2 – Discussions between local expert and PG-PAK.

3 - Article "Marché du tabac : Un secteur méconnu en mal de reconnaissance" by LE MATIN, Abou Réda, December 2019

<https://lematin.ma/journal/2019/marche-tabac-secteur-meconnu-mal-reconnaissance/328698.html>

Table 28 shows the assumptions used for current recycling rates in each country per item.

Table 28: Recycling Rate Assumptions

	Greece	Egypt	Montenegro	Morocco
Cigarettes	0%	Data from local expert ¹ .	0%	No data from local expert. Assumed to be 0% as with all country's modelled as part of the SUP Directive model ¹⁴⁷ .
Food containers	10%	No data provided by local expert. The value for Croatia used.	10%	No data provided by local expert. The value for Croatia used.
Straws	0%	Data from local expert ¹ .	0%	No data from local expert. Assumed to be 0% as with all country's modelled as part of the SUP Directive model ¹⁴⁹ .
Drinks bottles	20%	Data from local expert on percentage collected and percentage loss used to calculate the recycling rate ¹ .	10%	No data provided by local expert. The value for Morocco used as a conservative estimate.

1 – Communication between local expert and recycler.

¹⁴⁷ ICF Consulting, and Eunomia Research & Consulting (2018) *Assessment of measures to reduce marine litter from single use plastics: Final report and Annex*, May 2018, http://ec.europa.eu/environment/waste/pdf/Study_sups.pdf

¹⁴⁸ ICF Consulting, and Eunomia Research & Consulting (2018) *Assessment of measures to reduce marine litter from single use plastics: Final report and Annex*, May 2018, http://ec.europa.eu/environment/waste/pdf/Study_sups.pdf

¹⁴⁹ ICF Consulting, and Eunomia Research & Consulting (2018) *Assessment of measures to reduce marine litter from single use plastics: Final report and Annex*, May 2018, http://ec.europa.eu/environment/waste/pdf/Study_sups.pdf

¹⁵⁰ ICF Consulting, and Eunomia Research & Consulting (2018) *Assessment of measures to reduce marine litter from single use plastics: Final report and Annex*, May 2018, http://ec.europa.eu/environment/waste/pdf/Study_sups.pdf

2 – No source provided by local expert.

Individual litter rates for each item per country were calculated as part of the model, this is a more detailed approach than used in the SUP Directive model. The calculations were based on the following assumptions:

- Percentage of land litter from each country (Table 29)
- Annual litter rate per capital is 7.75 Kg for the countries modelled which is based on the highest littering assumptions from the SUP Directive model¹⁵¹; and
- A maximum littering rate of 20% for all items except cigarette filters.

The resulting littering rates from these calculations are presented in Table 30.

¹⁵¹ ICF Consulting, and Eunomia Research & Consulting (2018) *Assessment of measures to reduce marine litter from single use plastics: Final report and Annex*, May 2018, http://ec.europa.eu/environment/waste/pdf/Study_sups.pdf

Table 29: Percentage of Land Litter by Weight Assumptions

	Greece		Egypt	Montenegro		Morocco	
Cigarettes	0.3%	0.3%	No data provided by the local expert. Data for Greece used.	0.3%	Data provided by local expert as % of items collected ¹ : <ul style="list-style-type: none"> • Cigarette filters – 76% • Drinks bottles – 2% <ul style="list-style-type: none"> • Straws – 1% • Food containers 1% The percentage of items in land litter by weight is then calculated using weighted averages based on the average weight of each item and assuming that the average weight of litter is based on these four items only.	0%	Data provided by local expert as % of items collected ² : <ul style="list-style-type: none"> • Cigarette filters – 35% • Drinks bottles – 16% • Straws – No data • Food containers 4% The percentage of items by weight is then calculated using weighted averages based on the average weight of each item and assuming that the average weight of litter is based on these four items only. No data on % of items collected for straws – data for Greece used.
Food containers	2%	2%		1%		5%	
Straws	0.1%	0.1%		0%		0.1%	
Drinks bottles	9%	9%		5%		32%	

1 - Official data reported for Montenegro to the Barcelona convention.

2 – Data from marine litter monitoring operations conducted in Fnideq City as part of “Peche aux déchets” project.

Table 30: Litter rates calculated per item and country

	Greece	Egypt	Montenegro	Morocco
Cigarettes	37%	40%	35%	24%
Food containers	4%	20%	6%	20%
Straws	8%	20%	20%	20%
Drinks bottles	4%	12%	3%	20%

Table 31 sets out the modelled assumptions for the percentage of residual waste currently sent to landfill.

Table 31: Proportion of Residual Waste Sent to Landfill Assumptions

	Greece		Egypt		Montenegro		Morocco	
Landfill	84%	97%	Data from the local expert, 1% of waste sent straight to incineration ¹ and 34% send to landfill ² , used to calculate proportion.	100%	Data from local expert that there is no residual waste sent straight to incineration, therefore all residual waste assumed to go to landfill ³ .	100%	Data from local expert that there is no residual waste sent straight to incineration ⁴ , therefore all residual waste assumed to go to landfill.	

1 - *Unlocking Value: Alternative Fuels For Egypt’s Cement Industry - IFC study – 2016*
 2 – *No source provided by local expert.*
 3 – *No source provided by local expert.*
 4 – *No source provided by local expert.*

The assumptions used for 'Administrative Cost Adjustment' and the 'Litter Clean Up Cost' in the SUP Directive model have been adjusted for the country's modelled in this study. In the SUP Directive model the assumptions were based on data for Wales and the UK, respectively. For 'Litter Clean Up Cost', the average 'Cost of Elementary Work'¹⁵² in the modelled countries, for years 2015 and 2016, was used to adjust the previous assumption. For 'Administrative Cost Adjustment' the same methodology was used with data for the average 'Cost of Clerical Support'¹⁵³.

All other detailed data and key assumptions are set out in the Annex to the Impact Assessment study for the SUP Directive.

¹⁵² International Labour Organisations *Cost of Elementary Work*, <https://ilostat.ilo.org/topics/wages/>

¹⁵³ International Labour Organisations *Cost of Elementary Work*, <https://ilostat.ilo.org/topics/wages/>

A.5.0 Appendix: National Expert Report

E.1.0 Report on Montenegro

Authors: Alexandra Aubertin, Azra Vukovic and Marina Tomovic, National Experts for Montenegro

E.1.1 Key Market Trends

1.1.1 Overview of Market for SUP Items

Montenegro had a gross domestic product of 5.524 billion USD and population of 621, 873 citizens in 2019 according to the World Bank. Montenegro is one of the fastest growing tourist destinations according to the World Travel and Tourism Council. It has 3rd world ranking by the tourism growth in the 2018 forecast. Montenegro is a small economy, but when it comes to contribution to GDP, in 2018, contribution of travel and tourism to GDP (% of GDP) for Montenegro was 21.6 %. During 2019 Montenegro had 1.293.189 arrivals and 4.680.787 tourist nights. Montenegro is most visited during summer months starting from May until October. The biggest pressure is during August. In 2019 there were 220.915 arrivals only in August. Most of the population of Montenegro is based in the central part of the country, in the Capital City of Podgorica (156.000 or 30%), where during the year most of the consumption takes place.

Use of the selected SUP items (drink bottles, food containers, straws, cigarette filters) is widespread in Montenegro and used by local people throughout the year. Selected SUP items are highly used in the summer season as well, especially in the coastal zone. There is no production of the selected SUP items in the country; all SUP items are imported as a final product: cigarettes, beverages (water and juices), straws; as a packaging material: food containers and pre-forms of beverage packaging.

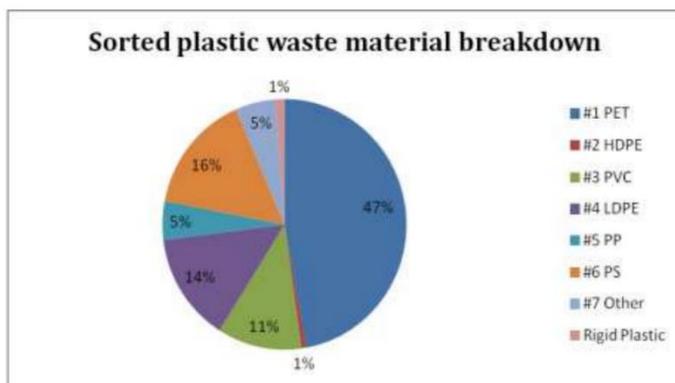
According to the **State Waste Management Plan (2016-2020)**¹⁵⁴, 89% of total waste generated in the country is collected, while the rest 11% is littered. There is no data on littering for specific selected SUP items, however estimated amount of Food and

¹⁵⁴ Government of Montenegro (2015), *State Waste Management Plan for the period 2015 – 2020*, accessible at <https://mrt.gov.me/vijesti/156710/Drzavni-plan-upravljanja-otpadom-u-Crnoj-Gori-za-period-2015-2020-godine.html>

Beverage Plastic littered or in dumpsites in Montenegro is 4kg per capita per year while estimated Food and Beverage Plastic collected and landfilled in Montenegro is 30 kg per capita per year based on the data from 2018.¹⁵⁵

Waste Audit Report for Montenegro (2019)¹⁵⁶ was prepared based on the information generated during the coastal clean-up day with the purpose to identify, quantify and analyse the composition of the waste stranded on Montenegrin beaches, riverbeds and lake shores. Based on the audited waste quantities from the 11 project locations, plastic waste represented 51.60%, 'other' waste 21.96%, metal waste 11.88%, glass waste 6.63%, organic waste 6.42%, and paper waste 1.51% by weight.

Based on the audited plastic waste, PET waste was represented with 47,15%, PS waste with 15,46%, LDPE with 15,46%, PVC with 11,15%, other waste with 5,27%, PP waste with 5,02% rigid plastic waste with 1,22% and HDPE with 0,62%.



Graph 1: Sorted plastic waste material (Source: Waste Audit report¹⁵⁷)

In relation to type of package, PET package was represented with 79%, aluminium can package was represented with 19%, Single layer package was represented with 1%, and HDPE package was represented with 1%, in the analysed sample.

E.1.2 Mapping the SUP Value Chain

A description/overview of the main life-cycle stage of the supply chain for selected SUP is given below.

¹⁵⁵ SCP/RAC (2019), *Priority areas of intervention to curb marine litter from food and beverage plastic packaging in Albania, Bosnia and Herzegovina and Montenegro*, accessible at: <http://www.cprac.org/en/news-archive/general/scp/rac-releases-priority-areas-of-intervention-to-curb-marine-litter-from-food>

¹⁵⁶ Zero Waste Montenegro (2019), *Waste audit report 2019*, accessible at: <http://www.euic.me/wp-content/uploads/2020/01/WASTE-AUDIT-REPORT-MONTENEGRO-2019.pdf>

¹⁵⁷ *Ibidem*.

Drink bottles are not produced in Montenegro, but imported. Most of the material is imported as a final packed product (juices and water). In the case of our own water production, plastic bottles are being imported as pre-forms (capsules) and filled in the country. Water and juices are usually packed in 0.5l bottles (16g), 1.5l bottles (36g) and 5 l bottles (81g). Separate collection of the plastic drink bottles is provided through separate collection of PET packaging in the following locations:

- Podgorica: 6 recycling yards (facility for separate collection of materials), regional recycling centre (sorting facility);



Picture 1: One of the six recycling yards in Podgorica

- Berane: eight “green islands” for selective waste collection;
- Žabljak: recycling centre Žabljak (sorting facility);
- Herceg Novi: 1 recycling yard; 1 material sorting facility;
- Kotor: 1 recycling yard, 1 material sorting facility;

Starting from 2019, there is organized collection of PET drink bottles in the headquarters of the Ministry of Sustainable Development and Tourism (MORT) in Podgorica.

In the Waste Audit Report (Montenegro 2019)¹⁵⁸, PET (clear or tinted drink bottles) was represented with 47.15% of plastic waste collected (out of 51.60% of total waste collected).

In Podgorica, PET is separately collected by the licensed company Deponija Livade with the amount of 7.06 tonnes, prepared for recycling in the Recycling centre (Sorting Facility) with the amount of 57 tonnes, and exported with an amount of 43.44 tonnes in 2019.

Food containers are not produced in Montenegro, but imported as well. There are two main companies, Micromedia and Tring, providing food containers for the needs of supermarkets and two main companies, PG-PAK and Enigma providing food containers

¹⁵⁸ *Ibid.*

for the Horeca sector. Food prepared in supermarkets as well as the deli section products are packed in transparent food containers made mostly of PVC plastic. EPS food containers are mainly used for takeaway by restaurants and cafes.



Picture 2: Example of food containers used for food packaging and takeaway in Montenegro

There is no clear information on the amount of separately collected food containers but according to our knowledge it is most probably non-existent as PVC and EPS are not collected by the main licenced company in Montenegro, Deponija Livade.

Straws are highly used during the summer season in the country. Not produced in Montenegro but imported. There is no organized separate collection or recycling. Most of them end up in sanitary landfills and very often in unregulated dump sites close to the beaches (the case in coastal town Ulcinj).



Picture 3: Example of straws packaging available on Montenegrin market

Cigarette filters - there is a small production of cigarettes in the country, but all of that production goes out of the country (exported), so the main consumption of the cigarettes is from the import. There is no organized collection of cigarette filters and there is a widely spread habit to throw away cigarette filters everywhere (on the street, at the beach, in the drain pipes, in nature).

Key players in the supply chain for project selected SUP are Micromedia¹⁵⁹ and Tring,¹⁶⁰ dealing with import food containers and one small percentage of plastic bottles. Two companies PG-PAK¹⁶¹ and Enigma¹⁶² are providing straws for the needs of the Horeca sector in the country.

E.1.3 Production and Consumption

Since there is no production in Montenegro, below are presented import volumes of selected SUP items.

Drink bottles: There is no clear information on the drink bottles imported in the country. However, there is information from National Statistic Agency of Montenegro (Monstat) on the import of non-alcoholic beverages in the amount of 40.512.289 EUR in 2019 presented in Standard International Trade Classification. It can be noticed that this amount is growing from year to year as presented in the table below (Table 2).

Table 1: Amount of imported non-alcoholic beverages in Standard International Trade Classification

Year	2017	2018	2019
Import of non-alcoholic beverages	39.680.709 EUR	39.887.966 EUR	40.512.289 EUR

Most non-alcoholic beverages are packed in the PET bottles in our market. There is no production of juices in Montenegro.

224 tonnes of PET packaging is used to pack production of water in Montenegro Company Water group in 2018. In the same year they had 41.7% of the total water produced in Montenegro¹⁶³. Based on this, it can be calculated that only for the water production /packaging in Montenegro, **537.17 tonnes of PET is used** ($22400/41.7=537.17$ tonnes). They produce/pack spring water Suza and Rada in plastic PET bottles. All products of the company are being placed in the Montenegrin market and there is no export to other countries.

Table 2: The ratio of bottle size and packaging for Suza water in 2018

¹⁵⁹ <https://micromedia.me>

¹⁶⁰ <https://tring-cg.com/>

¹⁶¹ <http://www.pg-pak.com/sr/>

¹⁶² <http://www.enigmacompany.me/>

¹⁶³ Government of Montenegro, Water Administration (2018), *Information on the implementation of concession agreements in the field of water*, accessible at: https://gov.me/sjednice_vlade_2016

Water Suza	0,5 litres	1.5 litres	5 litres
Amount of bottles (per year)	2.300.000	110.000	110.000
Bottle weight	16 g	36 g	81 g
Total weight	36 tonnes	39 tonnes	89 tonnes

Food containers: Based on the information from two main companies dealing with import and distribution of food containers, Micromedia and Tring, approximately 228 tonnes of food containers are consumed in 2019 in Montenegro. PG-PAK did not provide data on weight of the 5.546.000 pieces of food containers imported.

Table 2: Amount of imported food containers by Micromedia, Tring and PG-PAK

Company	Number of food containers (in 2019)	Weight (in tonnes)
Micromedia	5.640.140	102,88
Tring	7.000.000 (approx.)	125 (approx.)
PG-PAK	5.546.000	n/a
TOTAL	18.186.140	228 tonnes

Straws: The importer and distributor PG-PAK, holding 70% of the Horeca market share in the Capital City of Podgorica, according to their commercial director,¹⁶⁴ did not provide the amount of imported straws in tonnes but in pieces.

Table 3: Amount of imported straws by PG-PAK

Type of Packaging	Amount imported (in 2019)	TOTAL
1000/1	2.170	2.570.000 straws
500/1	800	
No numbers on weight per straw or per packaging were provided.		

¹⁶⁴ Information obtained at a stakeholder interview with PG-PAK commercial director.

Cigarette filters: There is no clear information on the amount of cigarette filters consumed in the country. However, there is information on imported cigarettes presented below (Table 4).

Table 4: Amount of imported cigarettes in Standard International Trade Classification

Import/Year	2017	2018	2019
Cigars, cheroots and cigarillos, containing tobacco	470.050 EUR	415.404 EUR	511.833 EUR
Cigarettes containing tobacco	14.989.179 EUR	9.598.588 EUR	14.017.792 EUR

In Montenegro 34,5% of adult population is smoking (15 to 65 years)¹⁶⁵. Number of smokers in the country is 152.200.¹⁶⁶

The types of plastic polymers and material composition are presented below for selected SUP items.

Drink bottles: Water bottles used in the country are 100% PET. There is a difference with the EU assumption related to the unit weight. Average weight of drink bottles in Montenegro is 44 g which is 8 g more than the EU assumption. Information is calculated based on the information from water producers in the country - Diva and Rada (Water Group).

Food containers: Majority of food containers in the Montenegro are 100% made of plastic materials, as they are used in most of supermarkets chains across the country as packaging. According to the data provided by Micromedia, PET makes up for 70% of their containers, polypropylene (PP) 20% and oriented polystyrene (OPS) 10 %. Average weight of these containers cumulatively (regardless of the material) is slightly higher than the EU assumption - 19.55 g. Information is based on the data gathered from Micromedia, importer and distributor of plastic packaging in Montenegro.

Straws: The importer and distributor, PG-PAK, could not provide the average weight of the straws as the packages are imported and they do not have weight indicated on them. Regular plastic straws found in supermarkets in Montenegro weigh from 0,3g for cocktail straw (13cm) to 0,8g for regular straw (21-25cm), as was determined during a field visit.

¹⁶⁵ Ljaljić Agim et al. (2019), *Montenegro 2018 Country report Global Youth Tobacco Survey*, Institute for public health accessible here:

<https://s3.eu-central-1.amazonaws.com/web.repository/ijzcg-media/files/1574197265-gyts-izvijestaj-2018-eng.pdf>

¹⁶⁶ World Health Organisation Europe (2016), *Tobacco Control Fact Sheet Montenegro*, accessible here:

https://www.euro.who.int/_data/assets/pdf_file/0005/312593/Tobacco-control-fact-sheet-Montenegro.pdf?ua=1

Cigarette filters: Material composition for cigarette filters is given the same as EU assumption, because there is no production in the country. According to the 2020 EU Report on Montenegro¹⁶⁷, seizures of illicit tobacco are regularly performed by the customs, the local or central police. The total amount of seizures in 2019 was 1,719,000 cigarette packs, amounting to EUR 3.9 million. Regarding tobacco control, the Law on restriction of use of tobacco products was adopted in July 2019. It is designed to align with the EU *acquis*. As a result, a smoking ban in public places has been in force since 1 August 2019. As regards illicit tobacco trade, significant challenges remain in reducing illicit tobacco trade.

Prices of materials placed on the market are presented below.

Drink bottles: Price of drink bottles is given based on the information from main importers of plastic packaging in Montenegro. It is 0.065 EUR and slightly lower than the EU assumption.

Food containers: Price of food containers is also given based on the information from main importers of plastic packaging in the country. It is 0,054 EUR which is almost 50% lower than the EU assumption.

Straws: Price for the straws is given based on the approximate price of the straws available on the market. It is 0,007 EUR and slightly lower than the EU assumption.

Cigarette filters: Price for the cigarette filters is given the same as the EU assumption, since there is no production in the country and price depends on the prices from import.

Prices for alternatives are given based on the available products on the market and are presented in the excel file.

In Montenegro there is no new/innovative plastic materials production. However, there could be innovative eco-labelled products found on the market, imported from other countries. As regards to the consumption, there are non-plastic alternatives of these items available on the market, such as cardboard food containers (mainly pizza boxes), reusable water bottles, etc. No tangible data on their prevalence was gathered.

Several types of takeaway boxes and other dishes for food and drinks, produced by Duni, based in Malmo, Sweden, made by compostable materials in their line ecoecho® are placed on the market of Montenegro. To be certified ecoecho® Duni product should live up to at least two of for environmental criteria: renewable, compostable, responsibly

¹⁶⁷ European Commission (2020), *Montenegro 2020 Report*, available at: https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/montenegro_report_2020.pdf

sourced or resource efficient. Product is made using materials that biodegrade in industrial composting facilities under the standard EN 13432 or ASTM D6400.

Above described products could be found in Montenegro in Podgorica, imported by the company Tehnobar.¹⁶⁸ There can be found several types of takeaway boxes, plates and cups made by compostable materials. All products have modern form, design and functionality. These products are made of compostable material bagasse, which is a natural by-product of sugarcane. Once composed it turns to soil in a few weeks. Unfortunately, these products are more expensive than those who are not biodegradable and not well promoted. Therefore, there is not a high demand for these products. To date, there are no composting facilities in place on the cities level in Montenegro, so the benefits of those products are not used to its full potential.

Table 5: Price ratio for biodegradable and plastic items

Items	Food container with lid	Cup 24cl	Cup 35cl	Cup 47cl	Straws
Biodegradable items	0,37 EUR	0,15 EUR	0,19 EUR	0,25 EUR	0,026 EUR
Plastic items	0,054 EUR	0,03 EUR	0,08 EUR	0,09 EUR	0,007 EUR
Source:	Data from excel file	Cup 25cl Enigma	Cup 35cl Enigma	Cup 45cl Enigma	Recorded

Regarding the alternative materials for straws, several bio-degradable and compostable straws are available on the Montenegrin market made by Brenta Company in Italy. Distributors confirmed to us that since plastic straws are way cheaper, consumption of these straws is very low in the Horeca sector in Montenegro. One home utility store imports metal straws as well. These metal straws are not widely used in Montenegro as they became only recently available and also, people are not so much aware of the benefits of these straws compared to plastic and are probably not ready to invest as they are significantly pricier.

¹⁶⁸ <http://www.tehnoar.me/>

E.1.4 Waste Management Policies and Practices

1.4.1 National Waste Management System

Waste management is regulated in Montenegro with the set of Laws and by-Laws. The most important umbrella law in this sector is the Law on Waste Management which was adopted in 2011 and amended in 2016. With relevance to municipal waste are the following Directives:

- Waste Framework Directive – targets transposed
- Landfill Directive – targets transposed
- Packaging Waste Directive – targets not accurately transposed

The objectives of the Law on Waste Framework Directive outline a target of at least 50% of the total amount of collected waste materials (glass, paper, metal, plastic, etc.) will have to be prepared for reuse or recycled by 2020, which has been transposed in line with the Waste Framework Directive. The targets for packaging waste are lower than those in the Packaging Waste Directive, and are set at 53% by 2019. There are also specific packaging recycling targets in place for paper/cardboard and plastic, but again, these are not in line with the Directive as there is no fixed date by which to attain them. In line with the Landfill Directive, targets have been transposed to divert the amount of biodegradable municipal waste going to landfill, at no more than 50% by 2020 and no more than 35% by 2025, but it seems unlikely that these targets will be met. The intention is for operators to apply and follow these targets as set out in their permit.¹⁶⁹

Law on Waste Management¹⁷⁰ defines a target of at least 50% of collected waste, such as paper, metal, plastic and glass from households and other sources should be prepared for recycling. This aim was planned to be achieved until 2020 following these targets: 25% to be prepared for recycling until 31st of December 2017; 35% to be prepared for recycling until 31st of December 2018; 45% to be prepared for recycling until 31st of December 2019; 50 % to be prepared for recycling until 31st of December 2020.

Law on Waste Management also regulates extended producer responsibility (EPR), stating that costs associated with waste should be borne by those generating it, but cost recovery is very limited. Producer responsibility is not being fulfilled to a satisfactory

¹⁶⁹ Eunomia (2017), *National Waste Assessment and Roadmap For Improving Waste Management In Montenegro* available at:

https://ec.europa.eu/environment/enlarg/pdf/pilot%20waste/Montenegro_en.pdf

¹⁷⁰ Official Gazette of Montenegro (2016), *Law on Waste Management*, (no. 064/11 from 29th of Dec 2011, 039/16 from 20th of Jun 2016), accessible at:

http://www.mrt.gov.me/ResourceManager/FileDownload.aspx?rid=245761&rType=2&file=Zakon%20o%20upravljanju%20otpadom%2064_11%20i%2039_16.pdf

standard for packaging waste, and the lack of consistent inspection of producers and importers means that requirements to register the amounts of special waste collected and treated are also lacking.

Outside legally-imposed producer responsibility, Recomont was created by industry in 2013 (by bottling companies Trebjesa, Coca-Cola, and Knjaz Miloš-Montenegro, each of which hold an equal share) to create a producer responsibility scheme to encourage recycling of beverage cans in the municipalities of Tivat and Kotor. Unfortunately, there is no information on the performance or whether the companies are still required to pay the fees for placing packaging on the market, but it does show that there is scope for industry to take on more responsibility.¹⁷¹

The new Draft Law on Waste Management to be adopted by the end of the year, according to the Directorate for waste,¹⁷² will define the extended producer's responsibility better and in an applicable manner.

According to the Report on the implementation of State Waste Management Plan for 2017, which is the last report published, the total amount of separately collected materials is 10% of total collected waste in 23 municipalities. Law on Communal Services defines roles and obligations of local self-governments in the terms of communal services including waste management on local level. Above mentioned Law on Waste Management defines that waste management in Montenegro is implemented according to the State Waste Management Plan and Local Waste Management Plans.

The State Waste Management Plan in Montenegro for the period of 2015 – 2020 was adopted in July 2015. Later in 2018, the Decision on Amendments for State Waste Management Plan for the period 2015 – 2020, has been adopted by the Government that defines the forming of four centres for waste management. It defines centre in Podgorica that includes Cetinje and Danilovgrad, centre in Nikšić that includes Plužine and Šavnik, centre in Bijelo Polje including Mojkovac, Kolašin, Pljevlja, Žabljak, Berane, Rožaje, Plav, Andrijevića, Gusinje and Petnjica, and center in Bar including Ulcinj, Herceg Novi, Kotor, Tivat and Budva.

State Waste Management Plan is proposing a two-bin system that includes “dry” and “wet” containers. This system is proposed for collection of recyclable materials in “dry” bins and other materials in “wet” bins and it is proposed instead of three different bins for separate waste collection of paper plastic and alu cans, which were not accepted by citizens in previous years in Montenegro.

¹⁷¹ Eunomia (2017), *ibidem*.

¹⁷² Paragraf Lex MNE (2020), *New Law on waste management underway*, accesible at: <https://www.paragraf.me/dnevne-vijesti/16012020/16012020-vijest2.html>

Based on the Law on Waste Management and State Waste Management Plan fourteen (14) Municipalities have prepared and adopted Local Waste Management Plans according to the Report on Implementation of State Waste Management Plan. During 2017, Local Waste Management Plans are adopted for Bar, Bijelo Polje, Budva, Gusinje, Danilovgrad, Žabljak, Kolašin, Plužine, Pljevlja, Rožaje, Tivat, Ulcinj, Herceg Novi and Šavnik. Other eight Municipalities, except Nikšić, prepared their local waste management plans during 2018 and they are approved by the Ministry.

In Montenegro there is no waste incineration in the incineration plant. However, open burning happens in landfills and specially in unregulated landfills, but there is no available statistics on this. There are two sanitary landfills in the country. One placed in the Capital City of Podgorica - “Deponija Livade” with a regional recycling centre, 5 recycling yards (sorting facilities where people can bring their waste prepared for separation) and temporary yards for construction, bio waste (from maintaining gardens and parks) and bulky waste. Second sanitary landfill is based in Bar, Deponija Možura, and used by six coastal Municipalities.

According to the Report on implementation of State Waste Management Plan for 2017 the situation is not better than in previous year in waste management. Based on the collected data, 254.523 tonnes of communal waste has been collected. Most of waste is disposed of in sanitary landfills in Bar and in Podgorica (61%). These two landfills are constructed in line with EU standards. Around 20% of waste is disposed of in temporary landfills. Municipality Nikšić is disposing of the waste in unregulated landfill and in total, around 10% of the produced waste in Montenegro was recycled.

According to the report from Deponija Livade in Podgorica, in 2019, there was in total 2186,59 tonnes of material exported for recycling. Most of this was cardboard (1439,08 tonnes). Besides this, there was HDPE plastics with an amount of 138,30 tonnes and PET packaging with an amount of 43,33 tonnes. There was no precise information on the items recycled in any of these categories, including plastic.

Table 6: Data from licenced company Deponija Livade for 2019 and 2018

Type of Material	Amount of material sold in 2018 (in tonnes)	Amount of material sold in 2019 (in tonnes)
Cardboard	1127.32	1439.08
Paper	643.68	557.71
HDPE plastic	64.3	138.3
Nylon	43.58	6.82
PET	71.22	43.44
Aluminium	2.72	0

Type of Material	Amount of material sold in 2018 (in tonnes)	Amount of material sold in 2019 (in tonnes)
Aluminium cans	0	0
Metal	31.6	1.24
TOTAL	2.028,48	2.186,59

There are neither official littering rates nor data on its prevalence. According to the findings of Material Flow Analysis, an estimated 21.000 tonnes of plastic packaging from the food and beverage sector are put on the market. Approximately, 2.300 tonnes (11%) ends up directly littered in the environment or in dumpsites.¹⁷³ What NGO active on the ground can confirm is that littering is present in almost every part of the country. There is little education in schools on that topic but the general awareness is increasing each year.¹⁷⁴ Official controls and fines for littering are almost non-existent although they are defined in laws, and local regulations. A lot of municipalities do not have regulated landfills nor do they have dedicated areas for construction or bio waste so an informal practice is to dump waste in the hinterlands or inland from the populated areas.

Since 2016, Zero Waste Montenegro together with other active environmental NGO's in Montenegro is organising the International Coastal Cleanup and Brand Audit in Montenegro at multiple locations across the country, at lake shores, riverbeds and beaches, following official BFFP methodology for brand audits.¹⁷⁵ In 2019, at over 11 locations in 11 municipalities across the country, little less than 6 tonnes of improperly disposed trash was collected by the volunteers and 51% of all waste collected was plastic. Out of all plastic collected, 79% was PET. So we can tell that a lot of trash finds its way in nature, then in watercourse and eventually ends up in the sea.

After each Cleanup Day, Zero Waste Montenegro publishes a waste and brand audit report with recommendations towards the Ministry of Sustainable Development and Tourism, local municipalities, communal utility companies, etc. At the moment, some municipalities have informed us of their interest but so far little action on the ground has

¹⁷³SCP/RAC (2019). *Priority areas of intervention to curb marine litter from food and beverage plastic packaging in Albania, Bosnia and Herzegovina and Montenegro*, accessible here: <http://www.cprac.org/en/news-archive/general/scp/rac-releases-priority-areas-of-intervention-to-curb-marine-litter-from-food>

¹⁷⁴ Looking at the number of signatures of the two petitions on banning plastic bags in the country, conducted by Zero Waste Montenegro, we can assume that the awareness is raising (3.137 signatures collected in 2016 and over 5.100 in 2018). For more information visit: <https://www.zerowastemontenegro.me/plastic-bags-ban-petition>

¹⁷⁵ For more information on BFFP brand audits methodology visit: <https://www.breakfreefromplastic.org/brandaudittoolkit/>

been noticed, most of the municipalities followed up on the recommendation set out in brand and waste audit reports so far.

1.4.2 Measures to Tackle SUP Consumption

In Montenegro, two petitions for single-use plastic bag bans have been initiated in 2017 and 2019, first one by NGO Zero Waste Montenegro and the other one by citizen group Ocisti.me. The first petition was signed by over 3.500 people and the subsequent petition by over 5.100 people which clearly shows that the awareness of Montenegrin citizens on single-use plastic issues is increasing. In 2019, the Ministry of Sustainable Development and Tourism confirmed that the new Draft Law on Waste Management will include provisions on banning not only plastic bags (except those under 15 microns) but also other nine SUP items listed in the EU SUP Directive.¹⁷⁶

Regarding possible measures, Zero Waste Montenegro is lobbying the introduction of for Deposit Refund Scheme (DRS) for beverage containers in the country¹⁷⁷ which would significantly increase the collection of recyclables (PET, glass, alu cans) and put prioritise reuse through refill systems for beverages producers and distributors, among other things. We expect that implementation of DRS in the country could generate new job positions. DRS would definitely increase the collection for recycling, as shown on other examples from Europe and other parts of the world.¹⁷⁸ At the moment, Montenegro reports lower numbers regarding recycling rates than the official state documents and plans envisage, meaning that Montenegro is not meeting its EU obligations regarding separate waste collection and recycling collection rates at the moment.¹⁷⁹

For available alternatives for SUP items please check above. In regards to measures to promote their use, we would suggest lower taxes for eco-friendly alternatives which, with increased taxes on SUP and additional financial obligations for producers within the EPR schemes, would make eco-alternatives more affordable to regular citizens and businesses.

There are other initiatives, for example, Delegation of the European Union in Montenegro conducted an awareness-raising campaign with famous Montenegrin sportsmen and grass-root activists on proper disposal of waste and recycling. It was a nation-wide campaign, and it was on TV and billboards.

¹⁷⁶ Bankar.me (2019), *News Article: Finally, in Montenegro plastic bags are going away*, accessible at:

<https://www.bankar.me/2019/05/23/konacno-i-kod-nas-plasticne-kese-idu-u-zaborav/>

¹⁷⁷ More info available at <https://www.zerowastemontenegro.me/deposit-return-scheme>

¹⁷⁸ For more information on DRS visit: <https://zerowasteurope.eu/2019/07/deposit-return-systems-an-effective-instrument-towards-a-zero-waste-future/>

¹⁷⁹ Investor (2020), *News Article: Montenegro must recycle half of its waste*, accessible at

<https://investitor.me/2020/08/04/crna-gora-mora-reciklirati-pola-otpada/>

1.4.3 Case Study Examples

Initiative: **Engaging beach users and snack bars for a clean beach in Velika Plaža (Long Beach), Ulcinj, Montenegro #VelikaPlasticFree;**

Implemented by: [Regional Development Agency – Ulcinj Business Association](#);

Supported by: Foundation Prince Albert II of Monaco and [Beyond Plastic Med Initiative](#).

Period of implementation: 01.08.2017 – 30.09.2018.

Initiative was aiming at sustainable management of tourism and its relation vis-à-vis plastic as well as raising awareness of both the public and institutions concerning the sources and consequences of plastic pollution. Overall goal was to reduce the amount of litter generated in Velika plaža, especially plastic litter, contributing to better environmental and beach attractiveness. In the frame of this initiative following results were achieved:

- Quick test was implemented on the use of plastic in 20 beach bars in Velika plaža.
- Direct contact was achieved with more than 20 beach bars.
- Contest was implemented for snack bar owners and best ideas were awarded with biodegradable dishes to be used instead of the plastic ones.
- Three language educational materials were prepared and shared with snack bars with advice for customers on how to reduce plastic waste.
- Photo contest was organized and three locally made reusable bags were given as a gift to the winners.
- At the end of the project, award event was organized and biodegradable dishes were shared to the beaches
- FB page @Velikaplasticfree was developed in the frame of this initiative and is still very active

Initiative: **Velika plaza without plastic;**

Implemented by: [NGO Green Life](#)

Supported by: The Prince Albert II of Monaco Foundation and [Beyond Plastic Med Initiative](#)

Period of implementation: 01.06.2019 – 30.09.2020

Initiative was aiming at raising awareness and changing behaviour related to the single use plastic, with the focus on several groups: school children, tourists and institutions. Overall goal was better environmental conditions in the area of Velika plaza, Ulcinj through reducing the amount of litter, especially single use plastic.

During the implementation period following results were achieved:

- Mapping and research of dumps in the area of Velika plaža was implemented. There were 22 illegal waste dumps in the hinterland with an approximate area of 26.670m² under the waste. This report was used in the presentation of the problem to the decision makers.

- Educational and awareness raise activities were implemented on the beaches (five workshops and three events);
- [Educational boards](#) were placed on three beaches;
- Promotion of activities was implemented through [@Velikaplasticfree](#) and [@ngogreenlife](#) pages on FB and nvo_green_life_ on Instagram.

Project: Ulcinj coast plastic free - ongoing;

Implemented by: NGO Green Life, NGO Zero Waste Montenegro, Association Ada Bojana, Regional Development Agency – Ulcinj Business Association, NGO Green Step, Dr Martin Schneider Jackoby Association;

Supported by: GIZ Montenegro through the regional project “Integrated Waste Management and Marine Litter Prevention”

Period of implementation: 01.06.2020 – 30.10.2021

Project Ulcinj coast plastic free is designed as a set of activities supported by NGOs who actively work in the area and institutions including Municipality of Ulcinj, Communal Utility and PE Morsko Dobro. Activities will be implemented in a synchronized manner aiming to reduce use of SUP at Long beach and Ada Bojana. The project has two main components and related activities including presentation of the project to the main stakeholders; development of concept for waste containers and container niche; market study and separate collection; training, application and eco patrol; promotion, education and awareness raise campaign; and cleaning and support to establish intermediate storage.

Project: Technical assistance to Montenegrin public authorities in preventing the single use of plastics and enhancing the outreach of waste management activities;

Implemented by: Zero Waste Montenegro

Supported by: SCP/RAC

Period of implementation: 09.2019 – ongoing

This project aims to provide advice to the Ministry of Sustainable Development and Tourism in Montenegro (MORT) and the Capital City of Podgorica on the main strategies and actions that would prevent the single use of plastics and improve management of plastic waste. After single-use plastic items and packaging were identified, recommendations for reduction of the SUP usage were prepared, specifically addressing each item in question, including more responsible alternative options (considering life-cycle assessment, economic and availability factors). At the Ministry, a separate collection of PET bottles was introduced and a protocol for the collection was convened by the licensed company Deponija Livade, on top of existing paper and cardboard collection. Project team assisted the Ministry with the implementation of alternative options in means and logistics. A presentation was held for the employees of the

Ministry and new practices were further communicated to the staff in a training workshop.¹⁸⁰

Due to external factors, the implementation phase in the premises of the Capital City of Podgorica has been delayed and will be resumed as soon as possible.

Example of replacement options agreed to be implemented at the premises of the Ministry (MORT)

Product/service	Baseline	Selected criteria	Adopted action
Still water	Plastic bottles	Eliminate certain products or materials	Tap water and guests glass jugs
Sparkling water	Plastic bottles	Select more recyclable or compostable materials	Non-reusable glass bottles
Soda drink	Plastic bottles	Selective waste collection	Recycle soda bottles
Stirrers	Plastic	Prefer reusable options	Small metal spoon
Straws	Plastic	Eliminate certain products or materials	No straw
Cutlery	Plastic	Prefer reusable options	Metal spoon
Sugar	Plastic	Minimise packaging	Sugar delivered in cubes and packed in cardboard
Rubbish collection	Lining plastic bags 30L	Selective waste collection	Introducing paper trays
Hands protection for cleaning	Latex gloves	Prefer reusable options	Natural Rubber/Latex gloves + durability training

¹⁸⁰ For more information on the project and the report visit: <http://www.cprac.org/en/news-archive/general/announcement-scp/rac-supports-the-ministry-of-sustainable-development-and-touri>

E.1.5 References

Title	Author	Date	Description	Key data	Assessment of quality of evidence (low, medium, high)	Assessment of strength of evidence (low, medium, high)
<i>Preventive measures to address the problem of marine litter</i>	Regional Activity Centre for Cleaner Production (CAR/PL)	Mar 2013	The report is listing measures targeting waste management of plastic packaging products (PPPs).	Measures targeting waste management stage; Measures targeting economic instruments.	High	High
<i>What a Waste 2.0 A Global Snapshot of Solid Waste Management to 2050</i>	Silpa Kaza, Lisa Yao, Perinaz Bhada-Tata, and Frank Van Woerden - WORLD BANK GROUP	2018	This report contains case studies of Tunisia and Israel regarding. It also analyses Extended Producer Responsibility Schemes in Europe.	Case studies of Tunisia and Israel.	High	High
Moving away from single-use: Guide for national decision-makers to implement the single-use plastics Directive	Break Free From Plastic Movement & Rethink Plastic	Oct 2019	This guide outlines the key elements of the SUP Directive and makes some recommendations on how national decision makers can best implement its provisions on single-use plastic	Steps towards effective EU-wide EPR schemes, explaining separate collection and refillable systems, example of national DRS in Germany, explanation of bioplastics,	High	High

Title	Author	Date	Description	Key data	Assessment of quality of evidence (low, medium, high)	Assessment of strength of evidence (low, medium, high)
<i>Stop the flood of plastic: Effective measures to avoid single-use plastics and packaging in hotels</i>	Dr. Bernhard Bauske and Martina von Münchhausen (WWF Germany) Achilleas Plitharas and Konstantinos Tsoukalas (WWF Greece)	Nov 2019	This report lists effective measures to avoid single-use plastics and packaging in hotels, analyses waste management in tourism destinations.	Case study for the island of Mallorca, description of waste disposal scheme in Spain and Greece, assessing SUP alternatives and risks of substitution.	High	High
<i>State Waste management plan 2015-2020</i>	Government of Montenegro	July 2015	Document is developed based on the Law and defines a planned system, aims, measures and activities.	Document presents the overview of the situation in Montenegro.	High	High
<i>Report on Implementation of State Waste management plan</i>	Government of Montenegro, Ministry of sustainable development and tourism	October 2018	Document gives an overview of implementation of State Waste Management Plan	Amount of recycled materials in the country.	High	High

Title	Author	Date	Description	Key data	Assessment of quality of evidence (low, medium, high)	Assessment of strength of evidence (low, medium, high)
<i>Waste Audit Report Montenegro</i>	Msc Snežana Marstijepović Zero Waste Montenegro	September 2019	Document identifies, quantifies and analyzes the composition of the waste stranded on Montenegrin beaches, riverbeds and lake shores in 2019.	Amount of PET bottles found littered.	High	High
<i>Priority areas of intervention to curb marine litter from food and beverage plastic packaging in Albania, Bosnia and Herzegovina and Montenegro</i>	Regional Activity Center for Sustainable Consumption and Production	2019	Document gives and overview of the situation with plastic from Food and Beverage Sector in the country	Amount of littered plastics from food and beverage sector	High	High
<i>Information on the implementation of concession agreements in the field of water</i>	Water Administration, Government of Montenegro	2018	Document gives an overview of water production in Montenegro	Based on the water production, we calculated amount of drink bottles	High	High

E.1.6 Stakeholder Engagement

Stakeholders Contacted (responsive)

Organisation	Name	Job Title
<i>Monstat</i>	Mašan Raičević	Industry sector
<i>Custom Administration</i>	Tatjana Vujisić	Custom department
<i>Nature and Environmental protection Agency</i>	Boris Nišavić	Independent Expert
<i>Landfill “Možura” Bar</i>	Senad Arabelović Jasmin Ćeman	Technical director
<i>Water Supply and Waste Water Ulcinj</i>	Fuad Hadžibeti	director
<i>Landfill “Livade” Podgorica</i>	Igor Šćepović	Deputy director
<i>Ministry of Sustainable Development and Tourism</i>	Igor Jovanovic	Directorate for Waste Management
<i>Ministry of Sustainable Development and Tourism</i>	Snezana Didanovic	Directorate for Utility Development
<i>Micromedia (importer and distributor)</i>	Zdravko Knezevic	owner
<i>Tring (importer and distributor)</i>	Jelena Radonjic	commercial director
<i>PG-PAK (distributor)</i>	Snežana Gajic	commercial director
<i>HDL Supermarkets</i>	Ivan Jovovic	CEO
Stakeholders Contacted (non-responsive)		
<i>Coca Cola HBC</i>	Andrea Radonjic	Public & Regulatory Affairs Manager
<i>Voli Supermarkets</i>		Wholesale Director
<i>Hemko (distributor)</i>		
<i>Bar-Kod (importer and distributor)</i>	Miodrag Zekovic	
<i>Enigma (distributor)</i>		

E.2.0 Egypt

Author: Fahmy Abdel Rahman, National Expert for Egypt.

E.2.1 Key Market Trends

2.1.1 Overview of Market for SUP Items

Egypt Socio Demographic context¹⁸¹

Egypt is the most populous country in the Arab world and the third most populous country in Africa, behind Nigeria and Ethiopia. Most of the country is desert, so about 95% of the population is concentrated in a narrow strip of fertile land along the Nile River, which represents only about 5% of Egypt's land area.

Table 1 – Egypt Socio Demographic context

Population	104,124,440 (July 2020)
Population distribution	Approximately 95% of the population lives within 20 km of the Nile River and its delta; vast areas of the country remain sparsely populated or uninhabited
Area	Total: 1,001,450 sq km Land: 995,450 sq km Water: 6,000 sq km
Coastline length	2,450 km
GDP	250.9 billion USD (2018)
GDP Growth rate	5.6% - 2019
Industry	textiles, food processing, tourism, chemicals, pharmaceuticals, hydrocarbons, construction, cement, metals, light manufactures GDP Share: industry: 34.3% Labour force: industry: 25.1%

¹⁸¹ The World Bank Group (2020) Country overview. Website:

<https://www.worldbank.org/en/country/egypt/overview>

Central Intelligence Agency (2020) The World Fact Book. Accessible at:

<https://www.cia.gov/library/publications/the-world-factbook/geos/eg.html>

Population	104,124,440 (July 2020)
Un Employment	total: 29.6%, male: 25.7% female: 38.3% (2017 est.)

Table 2 - Overview of the use of the four selected SUP items.¹⁸²

SUP Items	Usage	Remarks
Plastic Bottles	<ul style="list-style-type: none"> Bottled mineral water Bottled Soda soft beverages Bottled Dairy beverages Bottled cooking oil 	<p>Annual consumption of Plastic bottles is estimated at 200,000 ton of virgin PET annually.</p> <p>The market sales of soft drinks and mineral water are 10,552.0 and 299.4 EGP Million for the year 2019, respectively. With expected growth rate of 23% and 8.6% year-over-year</p> <p>Carbonated drinks sales for 2019 is forecasted at 273.2 EGP Million with growth rate 7.6% year-over-year</p>
Food containers	<ul style="list-style-type: none"> Take away food packaging Delivery food packaging 	<p>The Egyptian fast-food market, dominated by American chains, has experienced notable expansion since it began in 1970, and market sources expect the growth to continue at an annual rate of 15 percent over the coming years. The current food franchise market size is estimated at more than 680 million Euros (\$800 million).</p>
Straws	<ul style="list-style-type: none"> Take away and dine in beverages and juices Multi layered packed juices 	<p>Market size</p> <p>It is incredibly challenging to estimate the consumption of plastic straws. However, a number might indicate how big is this market</p> <p>the packed juices market sales in Egypt in 2019 was 9,979.4 EGP million with growth rate of 24% year-over-year.</p>
Cigarette filters	<ul style="list-style-type: none"> Pre rolled cigarettes Sold separately for manual rolling 	<p>89 billion cigarettes were produced in Egypt in the year 2016. Market size of 293.6 Billion Euros (346 billion USD).</p>

¹⁸²Fitch Solutions (2019) Egypt Food & Drink Report. Accessible through:

<https://store.fitchsolutions.com/all-products/egypt-food-drink-report>

Export.gov (2019) Egypt – Franchising. Accessible through:

<https://www.export.gov/apex/article2?id=Egypt-Franchising>

The American Cancer Society, Inc. and Vital Strategies (2018) The Tobacco Atlas, Accessible through:

<https://tobaccoatlas.org/>

2.1.2 Egyptian Plastic Industry & Ecosystem

Plastic Industry market background¹⁸³

- Egypt is the largest industrial country in the MENA region and the plastics industry in Egypt is growing steadily with over 2.1 Million tonnes. In 2018, Egypt consumed plastic materials and resins worth nearly 3.4 billion Euros (USD 4 billion)
- Egypt tops African polymer consumption with 2 Million tonnes, per capita consumption of 21.8 kg/head.
- Demand is expected to grow at the coming years, due to the increasing number of newly established & long-term planned mega projects. Egypt's plastics market is supplied 65% from imports and 35% from local sources.
- Investments at the plastics industry in Egypt in 2016 were 6.6 Billion Euros (USD 7.8 Billion), while exports of finished products reached 0.72 billion euros (USD 0.85 bn) as per the Plastics Industries Division.

2.1.3 COVID Impact on SUP consumption

The Government advised hospitality sector (Restaurants, coffee shops, Hotels, etc.) to use single use cutleries and Food packaging within their premises. Such policy was due to health measures and precautions adopted by the government to prevent the spread of COVID 19 while allowing the reopening of food service businesses. Consequently, it is expected that it will result in increased consumption of SUP items (Straws, cutleries, and food packaging).

Very few chains and entities adopted Single Use Non plastic products within their operations after such policy.

2.1.4 Availability of Alternatives

The Market of SUP alternatives is still an emerging market. Only Small enterprises and start-ups are providing alternative products on a Business to Customer model. Very few enterprises offering alternatives on a business to business model. Thus, a huge effort in supporting the small enterprises to scale their production lines to cater for businesses demand of alternatives to single use plastics items.

Examples of these alternatives are

- 1- Clay based reusable drinking bottle, locally sources and manufactured; Qarura: [Link](#)
- 2- Sugar cane-based food packaging; Thebes pack: [Link](#)
- 3- Paper and Metal straws for drinking; Elbadeel: [Link](#)

2.1.5 Geographic distribution of production, consumption, and waste/littering of the four selected SUP items

Production Distribution

Majority of industries producing SUP materials of Focus are within the industrial areas in Greater Cairo, Alexandria, and Delta governorates.

¹⁸³ Egypt International Plastic & Rubber Products Exhibition for Exporting (2020) Market background. Website: [Link](#)

Consumption and waste generation

According to the Environmental status report -2016 issued by Egyptian Environmental Affairs Agency in 2017. Municipal Solid waste generation rates per day is high in Greater Cairo, Alexandria, and Delta governorates. Waste generation decreases as we go down towards upper Egypt and coastal governorates.

Table 3 - Mapping the SUP Value Chain

SUP item	Material Supply	Manufacturers	Usage	End of Life
Plastic bottles	PET imported mainly from China, India, and Spain	3-5 Perform manufacturers control the market and supply to majority of bottlers	Bottling of Mineral water Soda soft drinks Juices and Cooking oil	Collection rates can reach up to 40% of consumption however quality of collection is not high enough to ensure proper recycling rate of Plastic Bottles. Informal sector plays a huge rule in the collection of Plastic bottles especially in metropolitan areas
Straws	Polystyrene and Polypropylene imported as raw material. Also, Straws are found to be imported as finished goods	Plastic manufacturers and food packaging companies are responsible for its distribution and manufacturing	Takeout and dine in beverages Packed juices	No collection or recycling activities spotted in the market.
Food containers	PET, LPS, Aluminium, and Foam imported as raw material. Aluminium is locally sourced	Plastic manufacturers and food packaging companies are responsible for its distribution and manufacturing	Takeout and delivery food packaging	Aluminium containers are recycled with high rates if it reached to collection & separation units. PET packaging is not favourable to some of the PET recyclers.

SUP item	Material Supply	Manufacturers	Usage	End of Life
Cigarette butts	Imported as finished product	Only one factory is responsible for manufacturing to all locally manufactured cigarettes.	Pre rolled cigarette Consumer rolled tobacco	No collection or recycling activities spotted in the market.

E.2.2 Production and Consumption

Table 4 - Plastic bottles

Production/Consumption volumes	201,590 Tonnes per year (2018)¹⁸⁴
Plastic polymer and composition	Virgin PET
Volumes of Virgin materials	201,590 tons annually
Prices of Virgin materials	550 Euro per ton (2020)
Volumes of Recycled Materials	Reported at 100,00 Tons annually exported as rPET or recycled to other uses rather than bottling purposes ¹⁸⁵
Prices of recycled materials	rPET sold at 820 Euro per Ton (2020)

Table 5 - Straws

Production/Consumption volumes	No sufficient data
Plastic polymer and composition	Polypropylene or Polystyrene
Volumes of Virgin materials	No sufficient data
Prices of Virgin materials	200 Euro per ton

¹⁸⁴ World Bank (2018) World Integrated Trade solution. Accessible at: <https://wits.worldbank.org/trade/comtrade/en/country/EGY/year/2018/tradeflow/Imports/partner/ALL/product/390760>

¹⁸⁵ Referred to only recycled PET into rPET. Other form of recycling PET to fibres and other products. Numbers is courtesy of Bariq recycling interviewed. <https://www.bariq-eg.com/>

Volumes of Recycled Materials	No sufficient data
Prices of recycled materials	No sufficient data

Table 6 - Food containers

Production/Consumption volumes	Food Packaging market valued at 3.2 Billion EGP¹⁸⁶
Plastic polymer and composition	PET, LPS, and Foam
Volumes of Virgin materials	
Prices of Virgin materials	550 Euro per ton (2020)
Volumes of Recycled Materials	No sufficient data
Prices of recycled materials	No sufficient data

Table 7 - Cigarette filters¹⁸⁷

Production/Consumption volumes	89 k tons per year
Plastic polymer and composition	cellulose acetate

¹⁸⁶ Total value of Food Service market is (18.6 billion Euros) in 2016 – The Future of Food service to 2021.

Link: <https://store.globaldata.com/report/cs0038fs--egypt-the-future-of-foodservice-to-2021/>

<https://www.verdictfoodservice.com/market-data/egypt-future-foodservice-2021/>

Quick Service Market (QSR) Value is Valued at approximately EGP 68.0 billion in 2016, the QSR channel represents a 30.6% market share of the Egyptian foodservice sector.

Full-service restaurants (FSR) at a market valuation of just under EGP 78.5 billion in 2016, the FSR channel is the largest foodservice channel by sales value, accounting for 35.3% of the total revenue generated within the foodservice profit sector.

Global Delivery and takeaway represent 15% and 12% market share of the total food service market

Packaging costs represents 8.5% of the total food cost - Packaging Considerations for the Food Industry by repsy: <https://www.repsy.com/blog/consumer-goods/packaging-considerations-for-the-food-industry>

Referring to the food market value of Egypt (QSM & FSM) = 146.5 billion EGP

Deducting 5% net profit, Food cost = 140 billion EGP

Delivery and Takeaway share = 27%, estimated market share = 37 billion EGP

Food Packaging market share 3.2 Billion EGP

¹⁸⁷ The American Cancer Society, Inc. and Vital Strategies (2018) The Tobacco Atlas, Accessible through:

<https://tobaccoatlas.org/>

Volumes of Virgin materials	Filter is imported as raw cellulose acetate and assembled in Tobacco industries
Prices of Virgin materials	1000 Euro / ton
Volumes of Recycled Materials	No sufficient data
Prices of recycled materials	No sufficient data

2.2.1 Production & Consumption of SUP Alternatives

Table 8 - Multiuse clay based locally manufactured drinking bottles

Production Consumption rates	Production capacity up to 10,000 clay based reusable bottle per month Current Consumption 450 bottle monthly
Market Share	No available data
Production cost	2.7 Euro per bottle
Market Price	4.3 Euro per bottle

Table 9 - Paper straws

Market Price	0.044 Euro per straw
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Table 9 - Biobased (Sugar cane) food packaging

Production/Consumption rates	1 ton per day production capacity
Market Share	No available data
Production cost	0.1 Euro / Pack
Market Price	0.19 Euro / Pack

E.2.3 Waste Management Policies and Practices

2.3.1 National Waste Management System

Main waste streams

Egypt generates around 100 M tons of waste annually, according to the latest studies conducted by the Egyptian Environmental Affairs Agency in 2017, the main waste streams is as follow:

Table 10 – Main Waste Streams

Waste stream	Estimated amount in million tons
Agriculture waste	31
Canals and irrigation network cleansing	26
Municipal solid waste	22
Construction waste	6.5
Industrial waste	5,3
Sludge	2.1
Medical waste	0.54
Hazardous waste	0.58
Total	93.72

*data provided based on 2016 reporting of the Environmental status Report – 2016. Egyptian Environmental affairs agency – Ministry of Environment.

Egypt target to recycle 80% of Municipal solid waste by the year 2025¹⁸⁸

The Egyptian House of Representatives had approved new waste management law on 24th August 2020, the new law text is still to be approved and issued by the Egyptian presidency. The official press release¹⁸⁹ quoted: Dr Yasmine Fouad, Minister of Environment, confirmed that after the President of the Republic issue the law and publish it in the Official Gazette, the first law regulating the process of managing the waste system of all kinds in Egypt will see the light, to express a new and different stage of dealing with a historical problem that Egypt has suffered for years in an existing strategic manner.

The draft law includes new rules facing the previous problems in addition to emerging problems, as its objectives include setting a general framework for planning and preparing strategies related to waste management, while ensuring that planning is linked to financing, codifying the basic required policies, the most important of which is the application of the extended liability policy for the waste generator to deal with some types of waste, A clear definition of the roles, responsibilities and persons involved in integrated waste management, ensuring the sustainability of the financial resources

¹⁸⁸ Enterprise (2019) Article: <https://enterprise.press/stories/2019/04/16/egypt-targets-80-garbage-recycling-rate-over-the-next-seven-years/>

¹⁸⁹ State Information Service (2020) Website: [Link](#)

required for integrated waste management, as well as establishing incentives for investment in the field of waste, and integrating all official and informal workers in the system

Extended Producer Responsibility:

Currently a national strategy for EPR is being developed and prepared by the EEAA in close collaboration with National Solid Waste Management Program and other developmental programs. Until date of issuing this report the EPR strategy was not publicly issued.

Separation and collection targets

77% of urban waste is collected while 15 percent of rural waste is collected. Estimated 96,000 informal waste pickers are active in Cairo and account for 10 percent of the waste collected in the city.¹⁹⁰

Treatment & Disposal infrastructure¹⁹¹

According to the National Solid Waste country report, Egypt have around 168 composting site, 94 Uncontrolled dumpsites, 60 controlled dumpsites and 9 landfills. Exact numbers and distribution among governorates could be accessed through the NSWMP (2013) ANNUAL REPORT FOR SOLID WASTE MANAGEMENT IN EGYPT (page 23)

In metropolitan cities, informal waste collectors' communities contribute heavily to the collection and treatment of certain waste items such as Plastic bottles, Aluminium cans, Cardboard and Glass waste. The formal waste management system is dependent on private or public waste management companies for collection and landfilling of municipal solid waste. A couple of waste management companies established their own separation and processing facilities to treat & Segregate the collected waste for further recycling processes. Other companies dump the collected waste into municipal landfills where informal segregators collect items of interest for further recycling processing.

Incineration

According to the International Finance Corporation (2016) Unlocking Value Alternative Fuels for Egypt's Cement Industry. Eight Cement plants co-processed 223,000 tons of RDF. The report emphasized that those Plants have already reached around ten percent of Thermal Substitution Rate (TSR) and could reach 20 - 40 percent goal by 2025. Additionally, five other plants are expected to begin using AFR within the next three years and which could reach 10 - 30 percent TSR goal by 2025.

¹⁹⁰ World Bank Group (2018) What a waste 2.0 accessible at:

<https://openknowledge.worldbank.org/handle/10986/30317>

¹⁹¹ NSWMP (2013) ANNUAL REPORT FOR SOLID WASTE MANAGEMENT IN EGYPT, [Link](#)

Table 11 - End-of-life waste treatment including subsections for each end-of-life practice:¹⁹²

	Collection	Recycling	Landfilling	Incineration
Volumes	17 Million Tons	3.4 Million tons	7.5 Million tons	223 K Tons
Rate	77%	20% of the collected waste	34% estimated	10%
Processes involved	Street cleaning and garbage collection	Separation Cleaning Shredding Processing	Collection and Landfilling	Collection Separation Shredding
Costs	50 Euro / Ton	25 Euro / Ton	35 Euro/ Ton	50 Euro / Ton
Key challenges	High littering rates Lack of segregated waste	Low quality and quantity of contaminated collected and separated wasted materials	High health risks due to uncontrolled segregation and collection	high moisture content of MSW waste mixed with organic waste
Technological developments Required	Separation from source at least for organic and non-organic materials is highly needed	High value material recycling for a better circular economy approach	More integration of anaerobic digestion technology in landfills	More incentives to support the RDF industry in Egypt

2.3.2 Measures to Tackle SUP Consumption

SUP bans

Red sea governorate Single Use Plastic bags ban is a strong local example on banning single use plastics across commercial sector within a touristic governorate. Such ban was initiated by the governor and imposed on all commercial outlets. The public responded positively to this ban.

Market incentives

Especially with the consumption of food containers and straws, the food service sector could be influenced to shift towards ecofriendly alternatives if incentives were adopted to support the transformation towards alternative non plastic packaging.

Voluntary initiatives

¹⁹² World Bank Group (2018) What a waste 2.0 accessible at:

<https://openknowledge.worldbank.org/handle/10986/30317>

International Finance Corporation (2016) Unlocking Value Alternative Fuels for Egypt's Cement Industry. Accessible through:

https://www.ifc.org/wps/wcm/connect/region_ext_content/ifc_external_corporate_site/middle+east+and+north+africa/resources/alternative+fuels

Online food ordering applications voluntarily committed to add a requested option to include plastic cutlery to the delivered orders. In case customers did not request this, no plastic cutlery will be attached to the orders. Such feature could be replicated with food packaging and plastic straws. Adding incentives and discounts to use alternative packaging and straws can support smoother transition towards non plastic food containers and straws

SUP taxes

The local government imposed several taxes on the tobacco industry, imposing taxes on plastic-based filters. Such tax shall influence the tobacco industry to invest in non-plastic alternatives to filters. In fiscal 2014/15, the Eastern Co. reported paying nearly 30 EGP billion in cigarette duties, which have become one of the government’s largest and most reliable sources of tax revenue at a time when the state is in dire need of cash.¹⁹³

Detailed breakdown of taxes imposed on cigarettes could be accessed through the World Bank Group (2018) ECONOMICS OF TOBACCO TAXATION TOOLKIT: [Link](#) page 193

Socio economic impacts

The plastic industry in Egypt is very well established and employees more than 500 k worker additional to almost 100 k informal collector and recycler. Plastic industries can adopt new bio-based materials for at least the food packaging products. It is recommended to optimize the collection and recycling value chain of plastic bottles without any measures to limit the consumption of SUP bottles as it will affect a huge number of formal workers and informal collectors within their daily income.

Table 12 – Stakeholder level of influence

SUP item	Stakeholder	Expected influence
Plastic bottles	Consumers	Consumers’ behaviour is a huge contributor towards increased usage of plastic as a packaging material to beverages and water. Despite the growing awareness on plastic bottles and their harmful impact on the environment. Consumers are concerned with health and purity measures that is driving the increased demand on bottled water in General.
	Bottlers	Plastic bottlers Influence the ingredients of the plastic perform (the pre-processed PET perform) and they – the bottlers - can decide whether to include Recycled PET in the manufacturing process of the Plastic bottles perform

¹⁹³ Fred Thomas (2016) American Chamber of Commerce in Egypt, COVER STORY - Healthier than ever Accessible through: [Link](#)

SUP item	Stakeholder	Expected influence
Straws	Consumers	Consumer awareness can decrease the demand on plastic straws and thus influence industries to phase out or substitute the SUP straw
	Juice packagers	Currently the packed juice industry is developing paper-based straw as an alternative to the plastic straw. However still the strategy of its integration in the market is not clear ¹⁹⁴
Food Containers	Food service business	The growing demand on takeout and delivery will influence an increase on SUP food packaging. However correct investments and policies towards the SUP alternatives will offer an opportunity to mitigate the SUP food packaging growth impact.
Cigarette butts	Cigarette industry	Investment could be mobilized to support organic alternatives for the plastic filters. A couple of local and global technologies were spotted in this area and could be accelerated

E.2.4 Case Study Examples

PET Collection optimization

PET recyclers import plastic wasted bottles to supply their industry, as the current local supply of PET wasted bottles is in terms of quality and quantity both insufficient to the local recycling industry. Thus, the PET separation and collection systems should be enhanced using the Extended Producer responsibility strategy to mobilize funds and finance to optimize the PET recycling value chain.

Glass returnable bottle

Beverage bottling companies in Europe started a discussion on pilot project to bottle mineral water and other beverages in a unified design of a returnable glass bottle. Companies only change the slip on any type of collected glass bottle according to their brand. Periodically, glass bottles are produced to compensate for losses and forecasted market growth.

¹⁹⁴ Tetra Pak (2019) Website: <https://www.tetrapak.com/about/newsarchive/first-carton-packaging-company-to-launch-paper-straws>

The idea behind adopting one single design for all bottled beverages and water offer an opportunity to decrease littering rates of water or beverage bottles while increase the reuse of manufactured glass bottles several times. Both parameters (littering and reusing) contribute heavily to the national waste management strategy.

The distribution, collection and production infrastructure of such solution is already well established. Such strategy could be scaled nationwide upon bottlers agreement.

Challenges mainly are within reusing technology to ensure high quality of finished glass bottles and the social acceptance of drinking in a reused bottle.

Other alternative is to rely on Aluminium packaging for mineral water which is also introduced by beverage companies. Although recycling and collection rates of Aluminium is quite good locally, the environmental impact of littering is still not favourable.

Product design for eliminating plastic straws

Several food services and beverage outlets adopted new designed beverage packages and caps (lids) that substituted straws. New innovative designs for beverage packages and caps can offer a feasible alternative while maintaining customer satisfaction. Starbucks¹⁹⁵ and MacDonald's are among the leaders in adopting such straw less lids.

Paper straws

Several local and global traders started to provide paper straws as an alternative to plastic straws. However, the social acceptance was not high due to low quality of products and problems associated with usage of the paper straw itself. Support to high tech Research & Development activities to enhance quality of manufactured paper straws.

Tetra Pak, one of the leading juice packagers confirmed working on a paper straw product development and that the patent will be open for other manufacturers to adopt. Yet up to date, no final progress has been done or announced.¹⁹⁶

Biobased Sugar-cane food packaging

Thebes pack introduced a sugar cane-based food packages that can be a strong alternative to plastic food packaging. The



Figure 7: MacDonald's Straw less lids copy rights to Plastics News photo by Jeremy Carroll

¹⁹⁵

Micheline Maynard (2019) Forbes Article accessible through: <https://www.forbes.com/sites/michelinemaynard/2018/07/09/as-the-anti-plastic-straw-trend-gains-speed-starbucks-decides-to-pull-plastic-straws-worldwide/#34968c1c2607>

¹⁹⁶ Tetra Pak (2019) Website: <https://www.tetrapak.com/about/newsarchive/first-carton-packaging-company-to-launch-paper-straws>

industry is still immature and thus facing challenges with competing with prices of conventional plastic and foam packages.¹⁹⁷

Sugar cane-based packaging offer a convenient alternative to customers as well as a sound environmental impact upon disposal.

Biobased cigarette filters

Green butts claim to offer cellulose based filter for tobacco industry. Such biodegradable alternative may offer the tobacco industry an opportunity to substitute plastic based filters.¹⁹⁸

Rejected Derived Fuel

As indicated in “Unlocking Value: Alternative Fuels for Egypt’s Cement Industry” report by the IFC¹⁹⁹, the alternative fuel from municipal waste represent a massive businesses opportunity yet an environmentally sound solution for end of life of plastic products. However, the rate of incinerated waste in cement industry furnaces is still extremely low compared to waste generated and collected.

Main challenges are within the quality of provided waste moister content which deteriorate the quality of the rejected derived fuel manufacturing process.

The market price of the RDF is 54.3 Euros/Ton (2015) sold to cement industries

Supporting access to finance and policy decisions to support such sector is urgently needed to support growth of this industry in Egypt. And to penetrate new markets other than the cement industries.

¹⁹⁷ Thebes Pack (2020) [Link](#)

¹⁹⁸ Green Butts (2020) Website: <https://www.green-butts.com/>

¹⁹⁹ International Finance Corporation (2016) Unlocking Value Alternative Fuels for Egypt’s Cement Industry. Accessible through: https://www.ifc.org/wps/wcm/connect/region_ext_content/ifc_external_corporate_site/middle+east+and+north+africa/resources/alternative+fuels

E.2.5 Stakeholder Engagement

Table 13 - Stakeholders Contacted

Organisation	Name	Job Title
<i>Thebes Pack</i>	Mohamed Taha	Chairman
<i>Nestle Waters</i>	Yasser Elshazly	Regulatory & Scientific Affairs manager
<i>Bariq Recycling</i>	Ahmed Nabil	Senior Commercial & Sustainability Manager – Bariq Recycling
<i>Qarura</i>	Ibrahim Abu Gendy	Co-founder and product designer
<i>Banlastic</i>	Ahmed Yassin	Co-founder and Marketing strategist
<i>PEPSICO</i>	Tarek Ibrahim	SQA and Technical packaging manager

E.3.0 Morocco

Author: Ayman Rachid, National Expert for Morocco.

E.3.1 Key Market Trends

3.1.1 Overview of Market for SUP Items

- Population: 35.7 million registered citizens in 2019, as the 7th biggest Mediterranean country by population size.
- Economy: €118 billion GDP in 2019, as the 58th largest nominal GDP in the world (2018) 8th largest economy in the region.

Drink bottles:

- Made of PET, and mainly used for: Water, soda beverages;
- At the cafes, every drink is served with a 25cl or a 33cl water bottle.
- Tap water is still the main source of drinkable water in Morocco, although the population consumes 18L/person/year of bottled water²⁰⁰. Glass bottles are less and less available, even if the deposit is still valid;
- Drink bottles are the most recycled plastic items (up to 60% of recycling plants outcomes, according to an interview we had with employees at Attawafoq cooperative^{201, 202}).

Food containers:

- Composed of PP, PS, or PET: a food container is a multifunctional item (used for bulk shopping, take away meals...). In the context of this research, containers used for take away is our main concern since it is most likely to end up as litter;

²⁰⁰Étude de faisabilité : Système de collecte des bouteilles plastiques et des canettes // SUNOV ENGINEERING (Octobre - 2018) ;

²⁰¹ WWF Mediterranean Marine Initiative (2018), Out of the plastic trap: saving the Mediterranean from plastic pollution, accessible at [https://www.wwf.org.uk/sites/default/files/2018-06/WWF Plastics MED WEB.pdf](https://www.wwf.org.uk/sites/default/files/2018-06/WWF%20Plastics%20MED%20WEB.pdf) ;

²⁰² Stated in the context of a research study on waste management in Morocco we conducted for ZeroZbel (a local environmental NGO), and specifically in an interview with employees at Attawafoq cooperative, a sorting/recycling plant in Oum Azza, near the landfill. More information is available here : https://www.firstpost.com/world/moroccan-trash-pickers-recycle-waste-to-fight-climate-change-set-example-for-developing-nations-2476916.html?fbclid=IwAR0oOSNI_T_t-wrqxZ0-bw3UrfnzP_4yvhyxD-MiHaoD8Kq9wMBUrNmJDE

- Available in different dimensions²⁰³;
- Provided by local companies (importers and manufacturers such as: Emballage alimentaire Maroc and Fastpak) to large supermarkets, local restaurants and coffeeshops, and also multinational restaurants chains.

Straws:

- Available in different types²⁰⁴;
- Made of PP;
- At the coffeeshops, small restaurants, and multinational restaurants chains, straws are served by default with every fresh drink;
- Sold at large supermarkets where it's rarely a part of consumers groceries;
- Generally, they represent low percentages in terms of littering (0.13 % in the context of a case study we took in account⁶).

Cigarette filters:

- The prevalence of smoking in Morocco is estimated at 18% in the population aged 15 and over²⁰⁵;
- Morocco is considered to be one of the biggest consumers of tobacco in the Mediterranean region, with more than 15 billion cigarettes per year²⁰⁶;
- Cigarette butts are often the most found item during beach litter monitoring operations. We refer here to a relevant experience on the coast of Mohammedia²⁰⁷, where they represented 16.3% of the collected items (in units' number);

²⁰³ Food containers are available in different dimensions in the Moroccan market. More details about sizes and volumes are contained in the following link : <http://emballage-alimentaire-maroc.com/recherche?q=barquette>

²⁰⁴ The main types of straws available in the market are provided by companies such as "Emballage Alimentaire Maroc". Three main types are mentioned here : <http://emballage-alimentaire-maroc.com/pailles-2452>

²⁰⁵ Template for Country Updating (information-sharing) for the Implementation Framework for Actions on Marine Plastic Litter, by Khaoula Lagrini (Ministry of energy, mines and environment, department of environment) in 2017. Available here : https://papersmart.unon.org/resolution/uploads/implementation_followup_stocktaking_morocco_final_3.pdf

²⁰⁶ Assumption of Lalla Salma Foundation for cancer treatment and prevention. Link : http://www.contrelecaner.ma/fr/le_tabac_en_chiffres#:~:text=Le%20Maroc%20est%20consid%C3%A9%20comme,milliards%20de%20cigarettes%20par%20an.

²⁰⁷ Results of 12 beach litter monitoring on the coast of Mohammedia using BreakFreeFromPlastic's methodology, in the context of BeOcean project (2019). Document available here :

- There is no law against throwing them on the ground. They are consequently drained by rainwater and finish in the sea.
- More details concerning the consumption of these 4 SUPs are available in the report.

Production:

- ▲ Water catchment and bottling sites (“Les eaux minérales d’Oulmès” holding 65% of the bottled water market)
- Coca-cola bottling factories
- Tobacco factories mostly based in Casablanca: SMT (Société Marocaine des Tabacs, JTI (Japan Tobacco International), Philip Morris

Consumption:

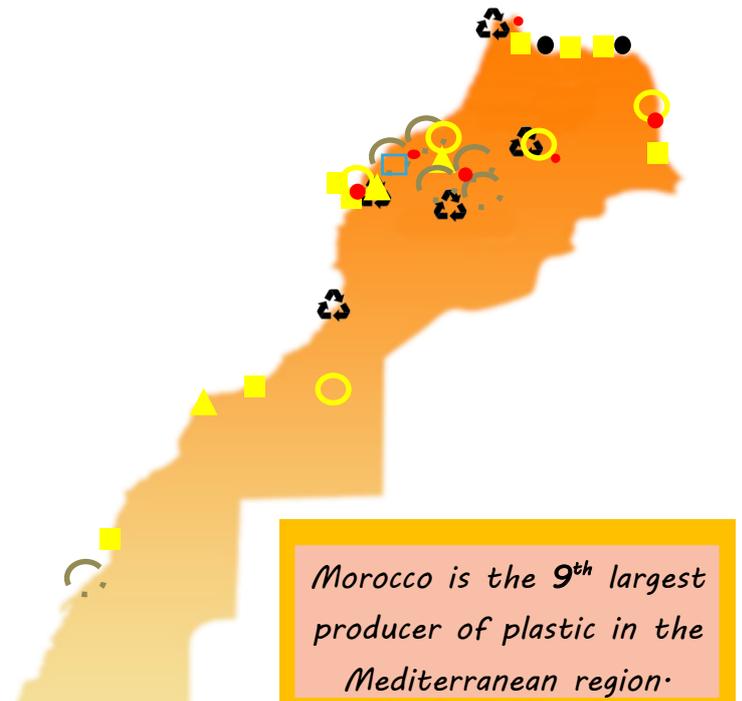
- 🍷 Drink bottles: 1275 million unit/year
- 🍷 Food containers: 150 million unit/year
- 🚬 Cigarette filters: 6.5 billion units/year
- 🥤 Straws: Unavailable data

Waste / Littering:

- Large landfill sites with a capacity of 100kT or more (up to 500kT and 1400kT processed respectively in Rabat and Casablanca)
- Small controlled landfills (Capacity <100kT)
- ⦿ Sites for landfills under construction

- A high daily plastic debris flux in the Mediterranean Sea (El Hoceima & Nador)²⁰⁰:
El Hoceima bay: 5.6kg/km daily plastic debris flux, Nador: 5.1kg/km daily plastic debris flux

- ♻️ SMRR recycling centers²⁰⁸



https://www.linkedin.com/posts/ayman-rachid-73141b139_beocean-project-bilan-environmental-activity-6657773186597302272-iIUd

²⁰⁸ 85% of collected drink bottles go to SMRR, la Société Marocaine de Récupération et de Recyclage (Moroccan Company of Recovery and Recycling), which operates five recycling centers across the country: Casablanca, Tanger, Marrakech, Agadir and Fes;

E.3.2 Mapping the SUP Value Chain

Moroccan plastic goods production: **0.71 MT** of plastic goods produced (2016) primarily driven by the packaging industry, representing **<0.2%** of the global plastic goods production. It is behind an energy consumption of **9M barrels/year** in oil equivalent, and **3.7 MT/ year** of CO₂ emissions²⁰⁹.

More specifically, the production of plastic packaging and single use items is mostly geared towards the local market, whose customers are relatively diversified. The food sector (fastfood, soft drink, ...) represents 99% of the clientel.

Three main types of raw materials can be used in the manufacture of single use plastics: polyethylene, polypropylene, polystyrene, cellulose acetate (only for cigarette butts).

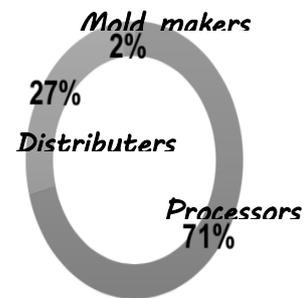
Local companies in the plastics processing sector (manufacturers and converters in the case of SUPs), import almost all the raw materials from Middle East. The main suppliers are **SABIC, EXXON MOBIL, BASELL** and **ATOFINA**²¹⁰.

Since Morocco highly depend on importations for raw material supply, the country has a negative import/export balance. It is important to mention in this context that the cost of freight is too high and it prevents direct exports of plastic goods²¹¹.

↘ Import of plastics (Raw material and products): **1665 million €** in 2016

↘ Export of plastics (Products and secondary material): **156 million €** in 2016

↔ Import/export balance of plastics: **- 1512 million €**



²⁰⁹WWF Mediterranean Marine Initiative (2018), Out of the plastic trap: saving the Mediterranean from plastic pollution, accessible at https://www.wwf.org.uk/sites/default/files/2018-06/WWF_Plastics_MED_WEB.pdf ;

²¹⁰La carton S.A, Note d'information AUGMENTATION DE CAPITAL PAR APPORT EN NUMERAIRE (2006), accessible at <http://www.ammc.ma/sites/default/files/LECARTON1.pdf> ;

²¹¹ Plastic value chain in south and east Mediterranean countries, July 15th, 2017 by Mamoun Ghallab (ZeroWaste Europe), available here: <https://drive.google.com/file/d/0B5gODS5h9OBYdUhZU0w1SktKMTQ/view> ;

We asked the customs administration²¹² for quantities of plastics imported, but due to a gap of data on the last years, we were advised to seek information from the exchange office. Information is still expected to be delivered. Although they approved the information we had from the chapter 39 of customs duties on importations, relating to plastics items and raw material.

The table in the appendix 3 represents a classification of references (codifications or pricing positions) in chapter 39 of customs duties on importations, under the four items of the SUPs scope²¹³.

The following figure gives an overview of the main life-cycle stages of plastics in general, it also provides the flows of plastics crossing the value chain from production to disposal or recycling²¹⁴. Due to information gaps regarding single use plastics in the national context, specific data for each item of the SUPs scope couldn't be gathered²¹⁵.



Source: WWF 2019

We present here briefly the role of each key player in the plastics supply chain & each stakeholder we have contacted for an informative purpose:

- Manufacturers/providers: Briefly introduced in the part 1.1.3 of the report;
- Moroccan Federation of Plastics: a professional association of companies manufacturing different types of plastic goods;

²¹² We refer here to the public institution in charge of customs and indirect taxes. Its indication in French is ADII (Administration des Douanes et des Impôts indirects);

²¹³ Most of data contained in the table has already been at our disposal, the customs administration has approved it and added some complementary information;

²¹⁴ This total production includes all plastic products manufactured using local (secondary) and imported (virgin) plastic material;

²¹⁵ ZeroZbel assumption, basing on the national recycled flows and the quantities collected by the wastepickers (both in the city and the landfill).

- Public institutions:
 - Customs administration: the agency responsible for collecting tariffs and for controlling the flow of plastic goods (either produced locally or imported);
 - Exchange office: an institution in charge of enacting measures to foreign exchange regulations and establish foreign trade and balance of payments statistics;
 - Environment department: an office that governs the strategies and plans regarding environment protection, taking part of the ministry of energy, mines and environment;
- *Waste pickers / Primary recycling plants owners: as the main actors in the recycling sector.*

We listed in the table below, previously to starting the data gathering, the key players in the supply chain, that we contacted. Appendix 3 lists the stakeholders contacted eventually and with whom we managed to have an interview.

3.2.1 Production and Consumption

- **Drink bottles**

The beverage market in Morocco, and specifically the part of production that relies on plastic bottling, concerns two major products:

- Mineral water (or table water)
- Soft beverages

Bottled water: There exist several brands of bottled water. Producers are located in many regions of the country and exploit different sources. The graph below represents the market shares that each producer occupies.

“Les Eaux Minérales d’Oulmès” has on its own more than 70% of the national market in terms of value (in 2016), and more than 65% in term of liters place in the markets²¹⁶. Followed by Sotherma (22%), Coca-Cola (5%)²¹⁷ and EAE (4%)²¹⁸.

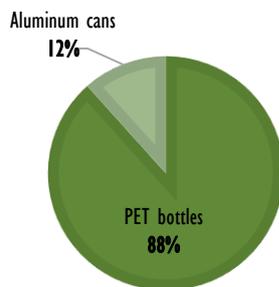
In mid-2018, bottled water consumption was estimated at over 1.15 billion liters of water. In terms of units’ number, the consumption has reached almost 823 million units²¹⁶, for a quantity of 25kT generated (Including PET for bottles and PEHD for caps).

	Stakeholders / Information sources	Purpose		Resources
		Specific	General	
Production	Hicham EL HAID: President of Moroccan plastics federation* (professional association of plastics producers)	Gathering updated data about plastics production (especially for member companies whose products are listed within the items selected)		Meetings (direct contact)
	Ryad MEZZOUR: Advisor to the Moroccan minister of industry, commerce, and green economy	Understanding strategies adopted by the industrial sector and legislative dispositions and regulations governing activities related to SUP	Assessing social and economic impacts of SUP production / Studying opportunities for implementing SUP alternatives / Testing willingness of the industrial sector to engage in UNEP's policy	Meetings / Calls (contact available)
	Production managers of different companies (depending on the plastic items/products selected) Exemples : L'Euro Africaine des Eaux, Eaux d'Oulmes... (producing PET bottles)	Quantifying quantities of items produced; gathering information about: sales figures/turnover, employment		Meetings/ interviews via calls
Distribution	Supply chain workers: Drivers working for the concerned companies, independent transport services providers	Quantifying quantities of products/items leaving the factories		Interviews
Consumption	Intermediate sellers, independent markets owners, merchants, consumers	Defining demand on items/products, defining the mode of consumption (frequency, quantities, purchasing power)	Testing consumers' willingness to go for SUP alternatives; Assessing social/economic impacts of implementing SUP alternatives	Surveys, interviews
Waste management	Yassine MAZOUT : founder of the first waste sorting center in Morocco (attawafiq cooperative*) Attawafiq cooperative employees	Quantifying incomes in terms of recyclable plastic (specifically PET as a major category), gathering information about: sales figures/employment	Assessing social and economic impacts of SUP /alternatives	Meeting/call (contact available)
	Companies delegated for landfills management: employees, persons in charge (Ex: Pizzorno)	Identifying different issues related to plastic items/waste in landfills (Ex: plastic bags going up in the air due to wind and end up in nature)	Assessing social, economic and environmental impacts of SUP /alternatives	Meeting/call (contact available)
	Waste pickers (Casablanca, Rabat ...)	Quantifying the proportion of plastic destined to recycling (in case the items selected are concerned), collecting information about incomes and personal dedication of waste pickers	Assessing social and economic impacts of SUP /alternatives	Interviews
	Recycling companies (Ex: SMRR)	Quantifying outcomes in terms of recycled plastic items, collecting information about: sales figures/turnover, employment		Interviews/research
NGOs	Mamoun GHALLAB : Cofounder of ZeroZbel*	Defining environmental/ social impacts of selected SUP, studying opportunities for implementing SUP alternatives (mainly depending on community awareness of SUP impacts and the contribution of civil society to the action aiming for a definite ban of SUP)		Meetings/ calls
	International network: Different members of GAIA* network and Break Free From Plastic movement*	Benchmark of international experience within NGOs that contributed through advocacy and the provision of technical support to the implementation of SUP alternatives		Calls

ENGINEERING (Octobre - 2018) ;

²¹⁷ Coca Cola delegates the bottling process to ECCBC (Equatorial Coca-Cola Bottling Company) through four factories located in Casablanca, Nouacer, Fès, and Marrakech / SBGS (Société des Boissons Gazeuses du Souss) located in Agadir / ABC (Atlas Bottling Company) located in Tangier and Oujda;

²¹⁸ EAE: Euro Africaine des Eaux, known under the brand “Ain Ifrane”, their water catchment and bottling site is located in a village called Ben Smim, near Azrou.



The demand for bottled water has grown exponentially between 2010 and 2018, with an annual growth rate of 0.92 (92.81%)²¹⁶. This allows us to model this evolution over the next decade (between 2020 and 2030).

Soft beverages: Coca Cola company and Pepsi are the two main producers of Soda in Morocco, other brands are produced or imported from abroad, as it's the case for SUNTURI group, in partnership with "Les Eaux Minérales d'Oulmès"²¹⁶.

The demand for Soda was estimated at over 633 million liters in 2018, representing over 451 million unit and 13.5 kT of plastic waste generated²¹⁶. Information concerning the market growth is not available.

It is important to mention the proportion of PET bottles in beverage containers production, comparing to aluminium cans (For both Soda and Energy drinks). As in the box below:

<i>Container type</i>	<i>Quantities produced (Tons)</i>
<i>PET bottles (Water & Soda)</i>	<i>38 521.50</i>
<i>Canettes (Soda)</i>	<i>4961.49</i>
<i>Canettes (Energy drinks)</i>	<i>86.26</i>
	<i>43569.25</i>

Data for drink bottles was elaborated in the context of a feasibility study conducted by the start-up SUNOV Engineering, aiming to implement a pilot project on a reward system for beverage containers. The estimations were based on the evolution of market between 2010 and 2016, and considering previsions of population growth, which is an important factor in market research.

- Cigarette filters

It is generally accepted that cigarette butts are the most littered item in the world and the introduction of indoor smoking bans in parts of the world, including Morocco, has made the issue even more acute. Since then, cigarette butts are most likely to end up as a litter.

There exist four operators in the national tobacco industry: Philip Morris International, Japan Tobacco International, British American Tobacco, and SMT (Société Marocaine des Tabacs). This last one holds the largest part of the market (57%), with 7800 employees (including 1000 direct jobs), creating 18000 indirect jobs as well²¹⁹. Cigarettes consumption has been constant for almost a decade (from 2010 to 2019), according to Ghassan Khaber, the corporate affairs director for SMT. It is approximatively evaluated at 15 billion cigarettes every year¹.

Morocco is the only country in the Mediterranean region that allows the importation of cigarettes. 55% of the cigarettes smoked in Morocco are imported, mainly from Switzerland then Turkey. Contraband represents less than 5% of the market and is in continuous decline. However, there is a mechanical effect between the decrease in illicit trade and the increase in tax revenue²²⁰.

552 million € of SMT's charges goes to the state budget under taxes on tobacco. Under Article 5 of the 2019 Finance Bill, the minimum tax rate was increased from 52.11 € to 57.91 € per 1,000 cigarettes, while the minimum tax burden was increased from 53.6 % to 58 %. Morocco received 10.48 billion MAD from the domestic consumption tax in 2017, up from 906 million € in 2016, according to customs administration²²¹.

All of the filters needed in Morocco are produced in Aïn Harrouda factory that was opened in 1994, occupying an area of 10 hectares, of which 45,000 m² covered. It has a capacity of 18 billion cigarettes a year and it is equipped with machines that manufacture 3300 filters per minute²²².

- Food containers

Data collection only concerned the trays used for take-away meals, generally made of polypropylene or polystyrene, under different dimensions.

In the context of a feasibility study conducted by Ucotra consulting²²³, an evaluation of the recyclable quantity in terms of food containers revealed that **1500 T** of trays is recycled each year. A percentage of 50% of the annual recyclable deposit, taking into

²¹⁹ Interview with Ghassan Khaber the corporate affairs director for SMT. Available here: <https://lematin.ma/journal/2019/marche-tabac-secteur-meconnu-mal-reconnaissance/328698.html>;

²²⁰ Moroccan Tobacco Company SMT Approves Tobacco Tax Increase, by Tarik Bazza (Morocco World News), November 6th 2018. Link: <https://www.morocoworldnews.com/2019/09/282816/contraband-cigarettes-moroccan-market-2019/>;

²²¹ Analysis of the economics of Tobacco in Morocco; Omar Aloui, march 2003. Available here : <https://untobaccocontrol.org/taxation/e-library/wp-content/uploads/2020/01/Aloui-Morocco.pdf>

²²² Analysis of the economics of Tobacco in Morocco; Omar Aloui, march 2003. Available here : <https://untobaccocontrol.org/taxation/e-library/wp-content/uploads/2020/01/Aloui-Morocco.pdf> ;

²²³ Proposition d'approche pour structurer la filière recyclage des matières plastiques, Ucotra consulting, October 30th 2015 ;

account the duration of use. It gives us an idea of the consumption of the trays, that can reach **3000 T/year** (100% of the recyclable deposit according to the study).

Basing on that, and EU assumptions on unit weights for food containers, which is **20g/unit**, the national consumption in terms of units is approximatively **150 million unit/year**. Except that the former number concerns all the types of use, not only take-away.

- Straws

As noted earlier in the report, straws are massively used in the Moroccan context. Every cool beverage is served with a straw, under different types. The most used types are: Elbow straws, fluorescent straws, black straws (with and without elbows), artistic straws.

Small cafes depend for their consumables on intermediate providers, who bring supplies weekly, including straws.

International restaurants chains and coffeeshops, are served by different local intermediates. Such as McDonalds, that get 50% of their supplies in term of packaging for take-away meals from local suppliers.

Precise information regarding straws consumption wasn't available for us²²⁴, for the following reasons:

- The unavailability of a number of stakeholders;
- The lack of traceability of imported and marketed flows.

E.3.3 Waste management policies and practices

3.3.1 National Waste Management System

Waste mismanagement in Morocco is worth **0,4% GDP**, meaning around **13 €** per inhabitant a year²²⁵. Let us start here by describing the legislative framework and governance of waste management in Morocco.

*First, it is regulated by*²²⁶:

- Law 28-00 relating to waste management

²²⁴ We have been trying to reach out to: The exchange office, ministry of industry, companies (Emballage alimentaire Maroc, FastPak

²²⁵ WWF Mediterranean Marine Initiative (2018), Out of the plastic trap: saving the Mediterranean from plastic pollution, accessible at https://www.wwf.org.uk/sites/default/files/2018-06/WWF_Plastics_MED_WEB.pdf ;

²²⁶ Research study on waste management in Morocco, Zero Zbel, September 2019. Available here: <https://drive.google.com/file/d/12NLucYN7f3c5fWKdvbdndBkHXHvqKv61/view?usp=sharing>

- Law n° 99-12 based on National Charter of Environment and Sustainable Development
- Organic law relating to municipalities
- Law 11-03 relating to the protection and enhancement of the environment.

As for the strategies, national plans and initiatives that has been undertaken at the national level²²⁶, we find:

- National Household Waste Plan: it is the most important strategy that the government set in order to develop the waste management sector. In the context of SUPs, we can highlight three main targets of NHWP:
 - Building 80 new landfill sites by 2020 (non-achieved);
 - Increase waste collection to 100% by 2030 (non-achieved);
 - Increase recycling rate to 20% by 2020 (non-achieved).
- Environment Protection and Management Program;
- National Strategy for Waste Reduction and Enhancement;
- Provincial and Prefectural Directive Plans.

In urban areas, 85% collection rate was achieved, but there is limited waste collection in rural areas. Waste is formally managed by municipalities but is mainly handled by the private sector and informal waste pickers. Most municipalities have contracts with private sector companies (More than 100 contracts all over the country), who operate waste treatment and collection through frequent tours and stops around each neighborhood². The waste containers are emptied within the collection vehicles (picture below) that take the waste either to a transfer station or a landfill.



Over **90%** of all waste has a linear fate as recycling remains limited, with only **0.05MT** of materials recycled:

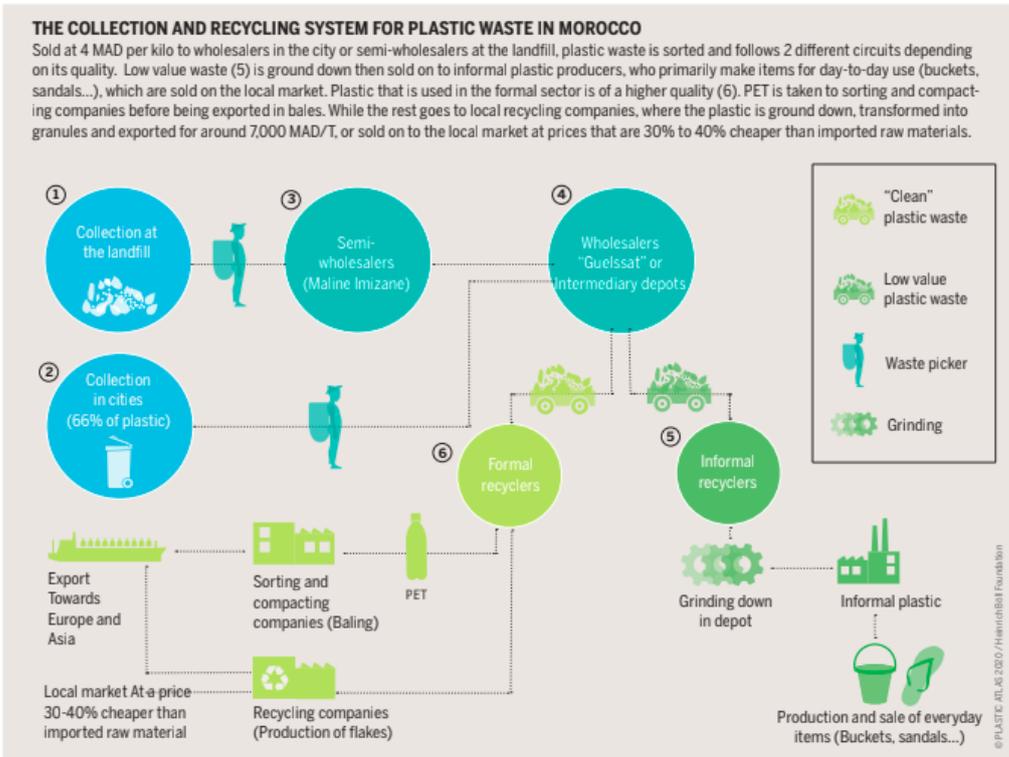
- Open dumping and open burning remain the most common methods of waste management, leading to dangerous leachate and toxic fumes;
- As of 2019 there were only **19 operating sanitary landfills** across Morocco, with plans to construct 80 new sites, and close **174 dump sites**²²⁵.

While municipalities are responsible for waste collection, **>34,000 informal waste pickers** are active both on the streets and in open dump sites²²⁶.

We concluded, from the interviews we have conducted with some of them, in Casablanca and Rabat, that unsorted waste is the main issue causing the recycling sector not to make any progress. When mixed with organic waste, plastic items contained in the bans lose their value as a recyclable material. Informal waste collectors are most active in plastic collection. This unregulated sector causes high-risks for its workforce, and it is not supported by the government.

Currently the plastic recycling rate in Morocco is estimated in **7%**, which represents **0.04MT** (70% of total materials recycled). PET bottles with their HDPE caps represent from 50% to 60% of the plastics recycled²²⁵.

We elaborate the scheme below in the context of a panorama on plastic waste management in Morocco, in a collaboration with Heinrich Boll Stiftung.²²⁷ It describes the intersection between formal and informal spheres of activity in the recycling sector.



Source: Heinrich Boll Foundation

In terms of waste management, it has been difficult to have a specific data on each single use item concerned by this research.

²²⁷ Rachid, A. (2020) *Morocco's Plastic Plague: A formal system... with informal connections*, accessed 19 November 2020, <https://ps.boell.org/en/2020/09/29/moroccos-plastic-plague-formal-system-informal-connections>

E.3.4 Relevant Policy on SUP Waste

- Waste recovery

Waste recovery, as it is currently practiced in Moroccan cities, is an activity carried out in very precarious conditions from a health, social and economic point of view. Three main factors characterize this strong precariousness:

- High risk of injury and contamination due to bare-handed handling of waste of all kinds
- A negative identity representation from residents (insults) and local authorities (confiscation of carts)
- A fragile and uncertain daily income (from 2.3 to 22.06 €), which depends on the prices imposed by the wholesalers and the contents of the bins.

However, these pickers working in these conditions daily for up to 12 hours a day, are the basis of a developing recycling economy, as affirmed by specialized factories such as "Marocyclage", that we visited in the context of this work.

Consequently, it seems essential that a willingness of the public authorities to develop the recovery of waste by upstream sorting takes into account the socio-economic situation of waste pickers. The implementation of an upstream sorting project is an opportunity for them to be aware and proud of the service they provide and to improve their living conditions.

Moreover, the professionalization of the sector guarantees the traceability of the products used, and therefore the nature of the use made of the finished products. A quality recycled material (traced, standardized, produced by certified professionals) could replace a large part of virgin material imports and help improving local economy.

In Casablanca, two informal waste pickers have been supported by Association Bahri (<https://www.facebook.com/AssociationBahri/>) in order to formalize their business and reinforce their commercial network: One waste picker has been equipped with a tricycle motorbike and the other with a tricycle electric bike. They have been put in contact with recycling companies that accepted to buy the materials they collect. A Facebook page was also created to promote their work and give their phone number to companies or individuals who can call them to collect their waste at home or at the office (<https://www.facebook.com/hamrilechiffonnier/>).

In many cities in Morocco, a start-up is launching a mobile app called "Eko-geste Dari" that allows users to ask for someone to come" and pick their plastics, paper/cardboard, glass.²²⁸

- Promoting Zero-waste practices:
 - Encouraging the use of reusable and locally produced items:
 - Traditional wicker bags for groceries;

²²⁸ <https://itunes.apple.com/us/app/ekoGgesteGdari/id1233504588?mt=8>

- Reusable water bottles;
 - Water clay jars (or public fountains) that can be available to people in public places, alleys, and natural spaces;
- Glass jars for bulk products.
Setting up drinking water screening systems (that generally cost between 183 € and 230 € for a long-term use) to clarify tap water and improve its quality, in household, restaurants and coffeeshops.
- Awareness raising for reducing the consumption of packaged products, through social media²²⁹, conferences, magazines²³⁰. Although, local activists affirm that awareness raising alone cannot be effective in the absence of a legislative framework.
- Tax arrangements and legislation:
 - Using the eco-tax²³¹ funds to afford financial support for the projects aiming to:
 - Set up deposit schemes for bottles and other kinds of recyclable containers;
 - Build recycling plants and create employment;
 - Implement waste recovery plants and upstream sorting projects;
 - Develop educational programs in schools to raise awareness among the youth;
 - Extended producer responsibility for producers, importers and providers of goods generating plastic waste, especially in the packaging/single use sector²²⁹;
 - Raising taxation for waste collection to encourage investment in waste collection infrastructure and ensure the different types of plastic are properly recycled²³⁰.
 - Increasing domestic consumption taxes, as in the case of drink bottles and cigarettes, two domestic taxes are already introduced:

²²⁹ Extended producers responsibility development in the context of Mediterranean Action Plan. Generally, such approach has been impractical in Morocco because of the

²³⁰ Morocco to raise taxes on soft drinks by 50%, By Tarek Bazza (Morocco World News), November 14th 2018. Link: <https://www.moroccoworldnews.com/2018/11/257691/morocco-raise-taxes-soft-drinks/>

²³¹ Eco-tax: Implemented by the finance law in 2016, that represents 1% ad valorem on importations of raw material and plastic items/production of plastic goods. This tax is supposed to afford an environment protection fund to finance recycling projects.

- Drink bottles: Raising domestic consumption taxes on soft drinks: Over 2 million people in Morocco suffer from diabetes and elevated blood pressure. A VAT of 6.43 MAD per 100 liters is applicable on sales of soft and non-carbonated drinks that contain 5 grams or more of sugar per 100 millilitres. The tax increase will reduce the costs of Morocco's social protection funds, which currently allocate more than 50% of their budget to diabetes and chronic diseases²³⁰.
- Cigarettes: Morocco is considered one of the biggest consumers of tobacco in the Mediterranean area. 90% of lung cancers are due to tobacco. Tobacco is also responsible for 25% of coronary insufficiencies including heart attacks, according to Fondation Lalla Salma for cancer prevention and treatment. The Government was given some tobacco-industry support for its decision to increase the tax on cigarettes, that was applied on January 1st, 2019²³².

- Litter monitoring programs:

Litter monitoring in natural areas (beaches, parks, streets, woods...) helps providing some key elements regarding plastic pollution and addresses the lack of data that mainly leads to ineffective decisions. NGOs across the world have developed different methodologies for litter monitoring, that can be adapted to the local environmental context. Some programs have concretely taken place. We mention:

- ZeroZbel waste audits: A first litter monitoring has subjected 26 beaches of the Moroccan coast in 2018. Some other operations are currently conducted in different regions over the country in order to study the circulation of plastic waste in watersheds, using Break Free From Plastic methodology on litter monitoring²³³.
- BeOcean project: headed by a local NGO "Horizons" in 2019, it was an analysis of beach litter on the coast of Mohammedia aiming to implement permanent evaluation measures, basing on UNEP's methodology on litter monitoring²³⁴.

²³² Le tabac en chiffres, Fondation Lalla Salma (Prévention et traitement des cancers). Available here : http://www.contrelecancer.ma/fr/le_tabac_en_chiffres#:~:text=Le%20Maroc%20est%20consid%C3%A9r%C3%A9%20comme,milliards%20de%20cigarettes%20par%20an. ;

²³³ Analyse des déchets sur les plages au Maroc, Association ZeroZbel, September 2018. Link: <https://www.zerobel.ma/wp-content/uploads/2018/09/Analyse-des-dechets-sur-les-plages-au-Maroc-Zero-Zbel-13-sept-2019.pdf> ;

²³⁴ Bilan environnemental, BeOcean Project by Ayman Rachid (in a collaboration with Association Horizons), June 2019. Available here: https://drive.google.com/file/d/1nEonchaEyv7JUzm_J9gN57RLhtxHJJoo/view?usp=sharing .

- SUP alternatives:
 - Drink bottles: Glass bottles have been in the Moroccan market for decades, it is better that they replace plastic bottles and that they are managed by deposit systems in order to minimize the operating cost for the companies that produce them;
 - As for consumables such as straws and food containers, there exist a variety of reusable items in the market:
 - Glass containers available in big markets such as Marjane, Aswak Assalam, and Carrefour market;
 - Wood/Bamboo straws commercialized by green brands such as [Green village](#).

3.4.1 Case study examples

Beside local initiatives such as “Hamri le chiffonnier” and “Eko-geste Dari” (mentioned earlier in this report), aiming to put in place an up-stream material recovery systems and promote better practices for waste management, we choose as a case study a down-stream sorting/recovery experience:

Start date: 16/06/2011

Annual treatment capacity: 215 000 Tonnes

Turnover: 368 000 €

Waste in-put: 600T

Product: 12T of recyclable material of which 60% is baled.

It employs more than 150 people mainly ex-pickers to sort trash for recycling on-site instead of on the streets. Employees have a monthly salary of 250 Euros in average, for manually sorting through almost half of the average 2000 Tonnes of solid waste that arrive each day at the landfill. In case the cooperative makes an additional profit, it is divided up between members and used to increase its capital.

Around 600 Tonnes of solid waste enter the sorting center daily. According to Yassine Mazout who heads the cooperative, and Jawad an ex-picker who works there, only 2% of the input is recyclable. 12T of recovered materials of which 50% to 60% is PET (bottles water and soft beverages). The cooperative is equipped with a baling machine in order to respond to the market standards and provide a quality material.

Before arriving to the center, solid waste collected all over Rabat/Salé/Skhirat/Temara region (counting almost 15 municipalities), goes through 3 transfer centers for a residence time of at least 24hours. That is the main challenge for a down-stream waste sorting and recovery experience like *Attawafiq*. The quality of recyclable materials, especially plastic, is degraded when organic and non-organic are not separated.



Information provided here was approved by Yassine Mazout during an interview with him and other employees of the cooperative in July 2019, in the context of the research study on waste management in Morocco.

E.3.5 References

Title	Author	Date	Description	Key data	Assessment of quality of evidence (low, medium, high)	Assessment of strength of evidence (low, medium, high)
<i>Étude de faisabilité : Système de collecte des bouteilles plastiques et des canettes</i>	<i>SUNOV Engineering</i>	<i>October 2018</i>	<i>A feasibility study conducted in order to implement pilot project on a reward system for beverage containers in Morocco.</i>	<i>Data relating national consumption</i>	<i>High</i>	<i>Medium</i>

Title	Author	Date	Description	Key data	Assessment of quality of evidence (low, medium, high)	Assessment of strength of evidence (low, medium, high)
<i>Étude interne sur la gestion des déchets au Maroc</i>	Ayman Rachid - ZeroZbel	September 2019	<i>A local study aiming to set a panorama on waste management in Morocco, conducted by ZeroZbel (a local NGO) in collaboration with Heinrich Boll Stiftung</i>	<i>Information on the informal sector and the national waste management</i>	Medium	High
STOP THE FLOOD OF PLASTIC	WWF	2019	<i>A guide for policy makers in Morocco, in the context of WWF's Mediterranean marine initiative</i>	<i>Overview of the national waste management and geographic distribution of infrastructures (landfills)</i>	High	High

<i>Title</i>	<i>Author</i>	<i>Date</i>	<i>Description</i>	<i>Key data</i>	<i>Assessment of quality of evidence (low, medium, high)</i>	<i>Assessment of strength of evidence (low, medium, high)</i>
<i>Plastic value chain in south and east Mediterranean countries</i>	<i>Mamoun Ghallab - Zero Waste Europe</i>	<i>July 15th, 2017</i>	<i>Exploratory study for Zero Waste Europe & Break Free From Plastic movement</i>	<i>Complementary information about plastics management in Morocco.</i>	<i>High</i>	<i>High</i>
<i>Proposition d'approche pour structurer la filière recyclage des matières plastiques</i>	<i>Ucotra consulting</i>	<i>October 30, 2015</i>	<i>A strategic suggestion to restructure the plastics recycling sector in Morocco</i>	<i>- Data regarding SUPs consumption, specifically food containers. - General information about the national plastics sector.</i>	<i>Medium</i>	<i>Medium</i>

Title	Author	Date	Description	Key data	Assessment of quality of evidence (low, medium, high)	Assessment of strength of evidence (low, medium, high)
<i>SwitchMed magazine Morocco</i>	<i>SCP/RAC - SwitchMed program</i>	<i>Winter 2018</i>	<i>Description of SwitchMed initiatives that support and connect stakeholders to scale up eco and social innovations.</i>	<i>Details about SUNOV Engineering's study as a case study example.</i>	<i>High</i>	<i>High</i>
<i>ENTRE CIRCUIT FORMEL ET PASSERELLES INFORMELLES</i>	<i>Ayman Rachid - ZeroZbel</i>	<i>20 Février 2020</i>	<i>An article written on Plastic Atlas Magazine edited by Heinrich Boll Stiftung, regarding plastics recycling sector in Morocco, and the main informal practices existing locally. https://ma.boeill.org/fr/2020/02/26/entre-circuit-formel-et-passerelles-informelles</i>	<i>Summary: Input flows to the recycling circuit, recycled percentage, non-recycled percentage.</i>	<i>High</i>	<i>Medium</i>

E.3.6 Stakeholder Engagement

Organisation	Name	Job Title
Fédération Marocaine de Plasturgie (FMP)	<i>Hicham El Haid</i>	<i>President</i>
Université Hassan II de Casablanca / LYDEC	<i>Dalila Loudiyi</i>	<i>Professor/ Civil engineer / Hydraulic expert</i>
Exchange Office	<i>Omar Allaki</i>	<i>Organisation and information system director</i>
Administration des Douanes et Impots Indirects (ADII)	<i>Lhassan Hallou</i>	<i>Facilitation and IT director</i>
Marocyclage (Recycling facility)	<i>Mohammed El Aaidy</i>	<i>Commercial director</i>
ZeroZbel (Local NGO, Break Free From Plastic Movement)	<i>Mamoun Ghallab</i>	<i>Co-Founder, Activist</i>
FastPak Maroc (Packaging provider)	<i>Latifa Majdi</i>	<i>Purchasing manager</i>
Association BAHRI	<i>Saad Abid</i>	<i>Founder, President</i>
State Secretariat at the Ministry of Energy, Mines and Sustainable Development	<i>Saloua Ameziane</i>	<i>Responsible for Sustainable Development</i>

Organisation	Name	Job Title
Equatorial Coca-Cola Bottling Company SL	<i>SoniaVentosa Garcia</i>	<i>Public Affairs & Communications Manager</i>
Adminisration des Douanes et Impots Indirects (ADII)	<i>Nabyl Lakhdar</i>	<i>General director</i>

E.4.0 Greece

Author: Eunomia Research and Consulting

E.4.1 Key Market Trends

The issue of marine plastic pollution in the Mediterranean is particularly acute in Greece. With over 3,000 islands, Greece has the longest coastline in Europe, attracting millions of tourists every year. Mismanaged waste is a key source of terrestrial-based plastic pollution in the country. Greece generates around 700,000 tonnes of plastic waste annually, which equates to 68kg/capita. Limited collection infrastructure and a prevalence to landfill waste, results in an estimated 39 tonnes of plastic waste entering Greek waters every day; the economic impact can reach €26 million each year.

The following sections examine the use of, and issues associated with, four SUP items in Greece, namely: beverage bottles, food containers, straws and cigarette butts.

4.1.1 Overview of Market for SUP Items

Greece is the 16th largest economy in the EU and has a GDP per capita of \$31,399 at purchasing power parity.²³⁵ Greece has a population of over 10 million mainly concentrated in urban and coastal areas. The consumption of the four SUP items covered by this study is likely to be greatest in the areas with highest population density, in particular Athens and Thessaloniki.

Tourism hotspots are also particularly significant in the use of drinks bottles, food containers and straws. Tourism is one of the most important industries in Greece. In 2018, around 33 million tourists visited the country, with over 75% of tourism occurring in the summer months.²³⁶ ²³⁷ This seasonal influx of visitors is highly likely to increase the consumption of these three SUP items, for instance through the increased purchase of take-away food and drink on beaches. With regards to beverage bottles, Greece is the

²³⁵ World Bank (2020) *GDP per capita, PPP (current international \$) - Greece*, accessed 11 September 2020, [https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD?locations=GR&most recent value desc=true](https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD?locations=GR&most%20recent%20value%20desc=true)

²³⁶ Hellas Journal (2019) *The data of the Ministry of Tourism are impressive: The revenues exceed 21 billion euros*, accessed 11 September 2020, <https://hellasjournal.com/2019/01/entyposiazoy-n-ta-stoicheia-toy-ypoyrgei-oy-toy-rismoy-ta-esoda-xepernoyn-ta-21-dis-eyro/>

²³⁷ WWF (2019) *Plastic pollution in Greece: how to stop it. A practical guide for policy makers*, accessed 1 May 2020, http://awsassets.panda.org/downloads/05062019_wwf_greece_guidebook.pdf

eighth largest consumer of bottled water in the EU.²³⁸ Hot summer weather and tourists, who are more likely to purchase bottled water rather than drink the tap water, contribute to high bottled beverage consumption.

This also impacts the waste management of these SUP items. During the peak tourist season for example, waste generation rises by about 26%. Indeed, local waste management can be overwhelmed; the coastal cities of Thessaloniki, Corfu and Heraklion are hotspots for plastic inputs into the sea.²³⁹

With regards to cigarette butts, Greece is one of Europe's main producers of tobacco and has one of the highest per capita consumption rates of tobacco products in the EU. In 2014 for instance, Greece and Bulgaria had the highest proportion of daily smokers at 27%.²⁴⁰ The Greek cancer Society estimates that nearly 22 billion cigarette butts, around 3,500 tonnes, enter the environment every year.²⁴¹

Whilst there is a lack of data on the amount of litter generated in Greece, beach litter counts can shed some light on the situation. According to the Hellenic Marine Environment Protection Association, in 2017, cigarette butts were the top litter item on Greek beaches, followed by plastics straws, food containers, bottles, plastic bottle caps and bags.²⁴² The production, consumption and waste management of the four focus SUP items is examined further in section E.4.2.

E.4.2 Mapping the SUP Value Chain

An overview of the value chain for the four SUP items of interest in this study are provided below. It is noted that specific data on the production, consumption and end of life management of each item were not readily available/ accessible, therefore necessitating the use of expert assumptions/ proxy data where available. The estimates below are therefore subject to a relatively high degree of uncertainty, though they provide a useful indicator of the pathways that each of the SUP items are likely to follow during the production, use and end of life phases.

²³⁸ European Federation of Bottled Water (2020) *EFBW: Key statistics*, accessed 11 September 2020, <https://www.efbw.org/index.php?id=90#greece>

²³⁹ WWF (2019) *Plastic pollution in Greece: how to stop it. A practical guide for policy makers*, accessed 1 May 2020, http://awsassets.panda.org/downloads/05062019_wwf_greece_guidebook.pdf

²⁴⁰ Eurostat (2020) *Tobacco consumption statistics - Statistics Explained*, accessed 11 September 2020, https://ec.europa.eu/eurostat/statistics-explained/index.php/Tobacco_consumption_statistics

²⁴¹ Kokkinidis, T. (2017) *Experts: Greek Beaches Could Turn into a Gigantic Ashtray*, accessed 11 September 2020, <https://greece.greekreporter.com/2017/08/11/experts-warn-that-greeces-beaches-could-turn-into-a-gigantic-ashtray/>

²⁴² Greek City Times (2018) *Over tourism and pollution real threats for Greece*, accessed 1 May 2020, <https://greekcitytimes.com/2018/06/11/over-tourism-and-pollution-real-threats-for-greece/?amp>

4.2.1 Production

Overall, it was estimated that around 0.94 Mt per year of plastic goods are produced in Greece, including all plastic products manufactured using local and imported virgin plastic material. It is estimated that production of PET bottles reached 2,840 million units in 2018 (Global Data estimates). In 2018, 202,100 tonnes of plastic packaging waste was generated. In addition, it is estimated that 28.72 billion cigarettes were produced in Greece in 2016, although imports accounted for a larger market share than domestic cigarettes. More specifically, in 2018 the five big companies ("Papastratos", "Tobacco Industry Karelia", JTI Hellas, BAT Hellas and Imperial Tobacco) recorded a turnover increase of 1.7% reaching 3.71 billion euros. The gross revenues of the five companies amounted to 705.5 million euros, marking a significant increase of 9.5% compared to 2017.

According to a report by WWF (2019), ~0.6Mt of virgin plastics are produced domestically in Greece per year, of which ~0.4Mt is exported (mainly polypropylene). An additional ~0.5Mt of virgin plastics, and ~0.3 Mt of secondary plastics are estimated to be imported. Overall, it was estimated that ~0.94 Mt/ year of plastic goods are produced in Greece (including all plastic products manufactured using local and imported virgin plastic material), of which ~0.19 Mt is packaging.²⁴³

4.2.2 Consumption and Waste Generation

Country-level data on the market volume (tonnes) of the 4 SUP types consumed is used as a proxy for the relevant SUP waste generated in Greece. This is a reasonable assumption, since SUP items are disposable, and designed for a single use before they become waste. Data were gathered from previous work for the European Commission. The data is summarised in **Table 1**, with further detail on relevant sources and assumptions below.

Table 1: Summary of SUP Consumption in Greece by Item

SUP Item	Waste generated (ktpa), 2019	Annual rate of growth in waste generated
Drinks bottles (inc. caps/ lids)	54.25	2010–2030: 1.25%
Food containers	2.79	2020–2030: 1.81% to 1.37%
Straws	0.46	2020–2030: 3.43% to 2.59%

²⁴³ ²⁴³ WWF (2019) *Plastic pollution in Greece: how to stop it. A practical guide for policy makers*, accessed 1 May 2020, http://awsassets.panda.org/downloads/05062019_wwf_greece_guidebook.pdf

SUP Item	Waste generated (ktpa), 2019	Annual rate of growth in waste generated
Cigarette butts	0.28	2010–2030: 1.1%

4.2.3 Drinks Bottles

For Greece, country level data on the units of plastic beverage bottles sold to consumers in off-trade retail were gathered from a Global Data market report forecast for the year 2019 from 2017. As this database did not include units sold in the HoReCa (hotels, restaurants and catering) industry, institutional or B2B sales, and exports, the estimate of units sold is likely to be an underestimate. Further data was not included to account for this underestimate due to the need for methodological consistency across any such data gathered – the Global Data sampling method could not be replicated in the scope of this work. This is not likely to present a significant limitation to the modelling, as plastic beverage bottle waste generated in these sectors is more likely to be managed within the formal waste system and less likely therefore to contribute to marine litter relative to sales direct to consumers (which accounts for the greatest proportion of on-the-go consumption and litter).

4.2.4 Food containers

Similarly, data used for food containers in this work was derived from underlying market data at the regional level from Transparency Market Research and apportioned using relative GDP across European countries, forecast forward for the year 2019 from 2017.

4.2.5 Straws

Data was sourced from Transparency Market Research who provided a report on the food service packaging market. These, alongside other estimates suggested that there is a clear level of uncertainty in these market projections, particularly for straws, but also other items. As no clear alternative data were available these figures were judged adequate and used in the modelling.

4.2.6 Cigarette Butts

The underlying data in the European Commission study that has guided this research was sourced from the inception impact assessment: Implementing and delegated acts under Articles 15(11), 15(12) and 16(2) of the Tobacco Products Directive 2014/40/EU. It was assumed that the consumption of cigarettes would equate to the consumption of cigarette filters. In addition, it is noted that the growth in consumption of cigarettes in Greece has been in decline since the early 2000s, partially due to steep price rises and restrictions on smoking.

E.4.3 End of Life Management

Based on the provision of/ access to separate collection systems provided for by the Hellenic Recycling Recovery Company (HERRCO), it is estimated that a maximum of ~90% of plastic bottles, takeaway containers and straws are captured by waste collection systems in Greece. However, a proportion this is assumed to be littered, and therefore does not enter this stream. Regarding this proportion, there is a lack of comprehensive data on the amount of litter generated in Greece, including figures for litter collected/managed by local authorities (through street sweepings, on-the-go bins, etc.). The proportion of litter that is unmanaged and remains in the wider environment is also unknown; it is likely to vary according to the clean-up effort allocated by each municipality, as well as the propensity to drop litter in each municipality, increasing the uncertainty of any estimate. As a result, it is likely that littering behaviour in Greece is similar to that across the EU, with roughly 1%-3% of items being littered, and roughly 88% of the plastic packaging fraction subsequently being managed by municipalities in the formal waste system. The remainder is likely to be disposed of via illegal dumping and/or open burning. For cigarettes, which do not adhere to the same consumption patterns as general packaging consumables, these litter estimates are not applicable, since cigarette butts are less likely to be collected in household/ municipal waste and are more prone to being littered (closer to a ~25% - 50% collection rate).

Of the proportion of the four SUP items of interest that do get collected, around 4-5% of those items that are recyclable get exported to other countries for treatment (including plastic bottles and food containers). This was estimated by calculating the proportion of exports for all plastic waste, scrap and parings (HS code 3915) to the overall plastic waste generated in Greece (estimated using Eurostat data) to arrive at the average proportion of plastic waste that gets exported.

Data gathered in previous work for the European Commission was also used to estimate the likely recycling rates (accounting for sorting losses and technical recyclability) of the four SUP items in collected waste. The remaining proportion of recyclable waste collected, after accounting for both exports and domestic recycling, ends up in the residual waste stream, alongside the aforementioned sorting residues and contaminants from recyclable waste. Straws, which may be collected but are not recyclable due to their small size, are also likely to end up in this stream.

It is noted additionally that some proportion of the waste that gets sent to recycling in Greece is lost to the wider environment, due to waste being blown away while being transported, or due to leakage on site. However, the amount of waste lost in this way relative to the total amount of recyclable waste handled at sorting plants and treatment facilities is likely to be quite low, as most sites are required to have plans in place for the storage and transport of waste, including prevention of litter leakage.

In the Greek residual stream, waste is largely landfilled, with only 1.2% of this stream treated by incineration as per data reported to Eurostat for the year 2016 on the treatment of municipal waste, excluding the proportion of waste reported to be recycled. Of this remainder sent to landfill, around 5% is likely to end up as litter in the

wider environment (due to poor storage, transport and management of sites, as well as waste being washed away due to winds/rain/erosion). This reflects the poor implementation of the landfilling standards set out in regulations in Greece to date, though this proportion is decreasing in recent years as Greece improves its performance in this regard. In the residual pathway, therefore, the key points of release into the wider environment arise from the poor storage and management of waste (litter blown, or washed away from landfill and recycling sites). Although it is likely that further leakage occurs in countries to which waste is exported, an estimate of the scale of such leakage is out of the scope of this study.

E.4.4 Waste Management Policy and Practice

4.4.1 National Waste Management System

Greece has historically struggled to implement EU environmental law, with waste management featuring prominently in the list of infringement cases that have been brought against the country. A high level of dependence on landfilling is observed, including the continued use of several illegal landfill sites (which do not meet the requirements of the landfill Directive) and a very low rate of source separation of waste (with high levels of contamination in the proportion of materials that are separately collected). For the non-household stream, including fishing gear, construction and demolition, etc. collection systems are even less developed.

Conversely, the country demonstrates generally high levels of compliance with the Urban Wastewater Directive, with a mix of sewerage and septage systems serving the vast majority of the population (~99% in 2015). Despite some issues in quality and provision of wastewater treatment more widely, incorrect disposal of flushable single use plastics via the drainage system (wet wipes, sanitary pads, etc.) is not widely reported, or such reports are not accessible.

Finally, regarding littering behaviour, the poor level of service provision for municipal waste collections make the distinction between littering behaviour and larger scale illegal dumping unclear, with studies on littering behaviour, as well as quantities of litter either formally managed or not, lacking in Greece. For litter that is subsequently collected, the pathway for SUPs converges with that of waste collection and management.

A variety of stakeholders are responsible for waste management in Greece, including: the Greek Ministry of Environment and Energy at the national level, the Hellenic Recycling Agency (EOAN) responsible for the approval, monitoring, and control of the existing operating systems in Greece, the Hellenic Recovery Recycling Cooperation (HERRCO) which is the competent authority (Producer Responsibility Organisation) for the design and implementation of recycling policy, municipalities responsible for waste collection and management at the local level. Several NGOs and charities are involved in improving waste management in Greece through voluntary actions such awareness

raising campaigns and pilot programmes. Given that most of the items under consideration in this study are packaging (drinks bottles, food containers and straws), we focus on packaging waste management systems in Greece in the following sections.

4.4.2 Packaging Waste Collection and Sorting

A variety of stakeholders are responsible for waste management in Greece, including the Greek Ministry of Environment and Energy at the national level and the Hellenic Recycling Agency (EOAN) responsible for the approval, monitoring, and control of the existing operating systems in Greece. Furthermore, the Hellenic Recovery Recycling Cooperation (HERRCO) is the competent authority (Producer Responsibility Organisation) for the design and implementation of recycling policies. Municipalities are also responsible for waste collection and management at the local level.

HERRCO's main activity is the development, funding, and operation of a network of "blue bins" for co-mingled packaging waste, in cooperation with municipalities. In 2003, HERRCO introduced the Blue Bin recycling system for co-mingled packaging waste collection: paper and cardboard, metal, glass and plastic. Between 2011 and 2015 the percentage of the population covered by the blue bin system is reported to have increased from 75% to 92% and in 2018 the reported coverage figure reached 95%. Over the same period (2011-2015), the number of Material Recovery Facilities (MRF) also increased from 28 to 32 and today there are 44, 9 of which are operated by HERRCO.

Moreover, the EPR fees producers are obliged to pay (2020) for plastic packaging put on the market (PoM) is 66 EUR /tonne, compared to 52.5 EUR /tonne for paper and card, 21 EUR /tonne for steel, 8.8 EUR/tonne for aluminium and 10.9 EUR/tonne for glass. These are recorded to be the lowest EPR fees in Europe.

In addition to HERRCO, AB Vasilopoulos and Antapodotiki are two other EPR schemes for packaging waste. AB Vasilopoulos is a supermarket chain which has operated recycling centres for own brand products since 2003. Up to seven different materials can be recycled including plastic bottles and plastic containers.

AB VASSILOPOULOS S.A. currently operates at a very small scale whilst Antapodotiki offers a reward scheme for packaging whereby consumers receive €1 with the return of 33 items of packaging waste (which could be aluminium, plastic bottles, or glass).

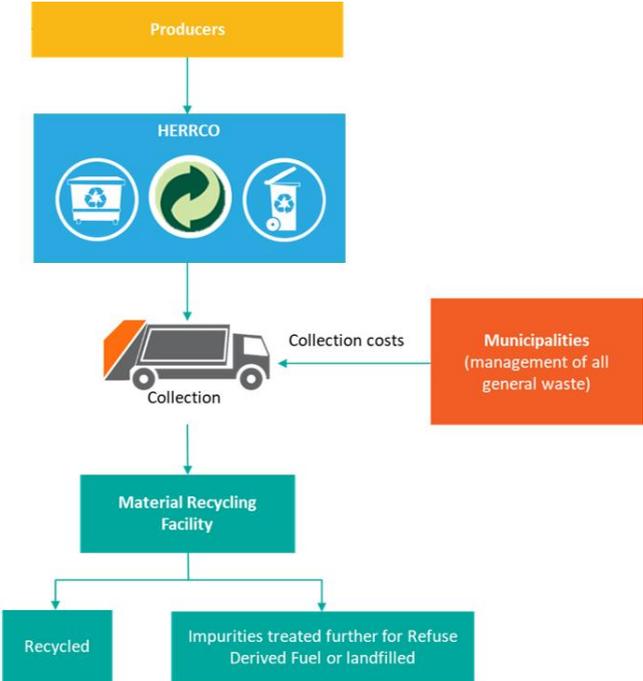
Contamination, as a result of low-consumer awareness, presents a significant challenge to the separate collection of recyclable plastic waste in Greece. Indeed, only 6% of all plastic waste is placed in blue bins and an estimated 50% of the content of the bins is contaminated.²⁴⁴ It is worth noting however, that the informal sector in Greece also plays a role here. Over recent years, the growing number of economic immigrants has

²⁴⁴ WWF (2019) *Plastic pollution in Greece: how to stop it. A practical guide for policy makers*, accessed 1 May 2020, http://awsassets.panda.org/downloads/05062019_wwf_greece_guidebook.pdf

resulted in the increased removal of high value materials from recycling bins, although this typically consists of paper, cardboard and metals rather than plastics.

Figure presents a diagram overview of the EPR system for plastic packaging in Greece.

Figure 1 Overview of plastic packaging EPR in Greece



4.4.3 Packaging Waste Treatment

In Greece, the majority of waste is sent to landfill. This includes plastic waste which is not separately collected and is instead disposed of with municipal solid waste (MSW) in the residual bins. Approximately 81.9% of municipal waste is landfilled and there are 75 active landfill sites across the country. However, not all sites meet landfill requirements, and despite efforts a number of illegal landfills and open dumping sites remain in use, at odds with the need to divert waste from landfills under national and EU targets. Indeed, in 2014, Greece faced a €10 million fine from the European Court of Justice for failing to meet the requirements to close illegal landfills.

In terms of waste treatment, there are currently six MBTs in operation: four MBTs in Kozani (since 2017), Ioannina (since 2018), Serres (since 2019) and Chania (since 2006 and has been upgraded) and 2 old MBTs in Athens (since 2007) and Heraklion (Crete, since 2008) that need upgrading. In addition, 17 new MBT units are to be procured by the end of 2020 according to national planning and with a total of 40 plants by 2021.

According to data reported to Eurostat, Greece recycled ~41% of plastic packaging waste in 2017 (compared to ~68% recycling across all packaging waste).

E.4.5 Relevant Policy on SUP Waste

Greece has already transposed relevant EU Directives into national laws. This includes transposition of the Packaging and Packaging Waste Directive and the Waste Framework Directive. In 2015, the National Waste Management Plan (NWMP) and the National Waste Prevention Plan (NWPP) were introduced. The purpose of the recently adopted NWMP 2020-2030²⁴⁵, is to outline the policy, strategy and targets for waste management, suggesting appropriate means by which to achieve the targets. These include:

- 10% of municipal waste maximum landfilled by 2030 (5 years earlier than the 2035 deadline of the EU Directive)
- 60% recycling of MSW by 2030
- Closure of all remaining illegal landfills by 2022
- Separate collection of biowaste at national level by 2022
- 30 to 38 MBT units by 2023 (in addition to the existing ones) (source: Annex III, NWMP)

The NWPP meanwhile, aims to promote sustainable consumption and reuse of products, principally through raising awareness of waste prevention. The latest NWPP is currently under revision.

The most relevant EU legislation is the Directive on the reduction of the impact of certain plastic products on the environment (SUP Directive). The objectives of the Directive are to: tackle marine litter, reduce consumption of single use plastic, and to increase separate collection and recycling. The scope of the Directive is based on the top 10 single-use plastic items found on beaches across the EU, which includes all four of the focus items in this study. The implementing act for the Directive is due to be published in Autumn of 2020. The Greek Ministry of Environment and Energy has now published, following adoption at the Greek Parliament, the national legislation on SUP to reflect the requirements of the SUP Directive (EU) 2019/904. The key policy measures are presented in the table below:

Table 32 SUP Policy Measures

Date	SUP Measure
3 rd July 2021	Restrictions on placing on the market (Art. 5): e.g., cutlery (forks, knives, spoons, chopsticks), plates, certain straws, beverage stirrers, food & beverage containers and cups made of expanded polystyrene and products made from oxo-degradable plastic.

²⁴⁵ Ministry of Environment and Energy (MoEE), *Εθνικό Σχέδιο Διαχείρισης Αποβλήτων, 2020 – 2030*: <https://www.e-nomothesia.gr/kat-periballon/apobleta/praxe-upourgikou-sumbouliou-39-tis-31-8-2020.html>

Date	SUP Measure
3 January 2022	Marking requirements (Art. 7.1): beverage cups will apply a 0.04 EUR + VAT
5 January 2023	Separate Collection (Art 9.1) Implementation of DRS in Greece
3 July 2024	Product requirements (Art. 6.1): e.g., beverage containers with a capacity of up to three liters permitted only if their plastic caps and lids attached to the containers during the products' intended use.
31 December 2024	Extended producer responsibility (Art. 8): other schemes
1 January 2025	Product requirements (Art. 6) Beverage bottles contain at least 25 % recycled plastic, calculated as an average for all PET bottles.
1 January 2025	Separate Collection (Article 9.1) By 2025, of an amount of waste single-use plastic products listed in Part F of the Annex equal to 77 % of such single use plastic products placed on the market in a given year by weigh
1 January 2030	Product requirements (Art. 6) Beverage bottles contain at least 30 % (35% for Greece) recycled plastic, calculated as an average for all PET bottles.

Following the requirements and policy direction of the EU, the Greek Ministry of Environment has proposed a number of approaches to tackle plastic pollution in the past. Greece has already transposed relevant EU Directives into national laws in the past namely:

- Law 2939/2001 and the New Recycling Law 4496/2017 transposed the PPWD. The revision allows municipalities to manage recyclable material and the revenue this generates themselves, obligating the separate collection of paper, glass, metals and plastics;
- Law 2939/2001 also established the producer responsibility organisation HERRCO, which has been responsible for the majority of packaging waste recycling in Greece since 2003. In 2010, Law 3854/2010 enacted the 'polluter pays principle' as state law;
- The National Waste Management Plan, introduced in 2003 as an annex to the Ministerial Decision 50910/2727/2003 'on measures and terms for solid waste management - national and regional planning management';
- The Law on Waste Management 4042/2012 transposes the WFD. Under the law, from January 2014, the disposal of untreated waste into landfills is subject to a tax from €35-€65/tonne. However, the tax is yet to be implemented;

- The Law 4496/7.11.2017 enacted a charge for lightweight plastic carrier bags with a wall thickness below 50 microns. In January 2019, the cost of such bags increased from €0.04 to €0.09. The outcome of current public consultations could see the charge applied to all plastic carrier bags in the future;²⁴⁶
- The Law 4609/3.5.2019 introduced the Circular Economy Fee. This replaces the proposed landfill tax of Law 4042/2012. Beginning in 2020, the fee will incorporate garden and park waste, municipal waste and separately collected waste, including separately collected municipal packaging waste which is disposed of by landfill.²⁴⁷

In addition, in 2015, the National Waste Management Plan (NWMP) and the National Waste Prevention Plan (NWPP) were introduced. The purpose of the NWMP, which is currently under review, was to outline the policy, strategy and targets for waste management, suggesting appropriate means by which to achieve the targets. The key targets focus on the allocation of waste management to municipalities and the reduction in generation of waste, as well as targets concerning municipal solid waste and landfilling.

In comparison, the NWPP 2015-2020 aims to promote sustainable consumption and reuse of products, principally through raising awareness of waste prevention. The Plan identifies priority areas, including packaging waste and WEEE, and, in accordance with EU legislation, proposes targets and actions to tackle each priority waste stream.

In 2018, the National Action Plan on the Circular Economy proposed a set of goals for 2030, including moving up the waste hierarchy, supporting circular consumption of products such as reuse and repair and monitoring progress towards a circular economy. The introduction of quality standards for secondary raw materials is also stated.²⁴⁸

There is currently a turning point in the waste management sector in Greece, as the Circular Economy Package, adopted by the EU in 2018, made amends to three key directives: The Waste Framework Directive (WFD), the Packaging and Packaging Waste Directive (94/62/EC) and the Landfill Directive (1999/31/EC). In addition, the Single Use Plastic Directive (2019/904) adopted in 2019 is enforcing bans on specific SUP items while promoting alternative ones and encourages increase in the demand for recycled plastics. Therefore, the Ministry of Environment and Energy (ΥΠΕΝ) is currently revising the national legislation to reflect key amendments including:

²⁴⁶ Ελληνικός Οργανισμός Ανακύκλωσης Πλαστική Σακούλα Μεταφοράς, accessed 2 June 2020, <https://www.eoan.gr/uploads/files/578/80e6f51406fb6435a8d778e8bf3620a9628ca5f8.pdf>

²⁴⁷ Kodiko (2020) ΝΟΜΟΣ 4609/2019, accessed 2 June 2020, https://www.kodiko.gr/nomologia/document_navigation/513763/nomos-4609-2019

²⁴⁸ Ministry of Environment & Energy (2018) *National Circular Economy Strategy*, accessed 2 June 2020, https://circulareconomy.europa.eu/platform/sites/default/files/national_circular_economy_strategy.pdf

- The Plastics Strategy²⁴⁹ has identified plastics packaging as a priority area when it comes to design for recyclability and reuse²⁵⁰. It sets out the **goal that by 2030, all plastics packaging placed on the EU market is reusable or easily recycled**.
- Contributing to this, a review of the Packaging and Packaging Waste Directive's²⁵¹ essential requirements²⁵² as part of a wider Commission Initiative to improve packaging design; promote reuse and recycling; increase recycled content in packaging; tackle excessive packaging and to reduce packaging waste, is currently under way with a view to, inter alia, **improving design for re-use and promoting high quality recycling**.
- Furthermore, the review of the EU waste legislation in 2018 also enshrined a number of elements to drive reuse and recycling of plastic and plastic packaging waste. Inter alia, the respective recycling (including reuse) targets were substantially increased, with **the target for recycling of plastic packaging waste to double from currently 22.5% to 55% in 2030**.
- In addition, the obligation and common minimum requirements for extended producer responsibility (EPR) will drive design for recycling of plastic packaging through the requirements of fee modulation under the EPR. To support the implementation of related legislation, the Commission is preparing guidelines on EPR and on the separate collection and sorting of waste. Eunomia recently completed a study to support the preparation of the Commission's Guidance for Extended Producer Responsibility Schemes, also covering Member States' good practices.²⁵³
- The Plastics Strategy and Directive 2019/904(6) are also **promoting the increase in the demand for recycled plastics by setting ambitious objectives for recycled content in plastics products while encouraging the introduction of Deposit Refund Systems (DRS) to improve both quality and quantity of plastic**.

E.4.6 Case Studies

- **Public Sector Single Use Plastics Initiative**

²⁴⁹ European Strategy for Plastics in a Circular Economy, COM (2018) 28 final.

²⁵⁰ Plastic packaging accounts for about 60% of post-consumer plastic waste.

²⁵¹ Directive 94/62/EC of the European Parliament and the Council of 20 December 1994 on packaging and packaging waste, OJ L 365, 31.12.1994, p. 10.

²⁵² Directive 94/62/EC on packaging and packaging waste, Article 9 and Annex II.

²⁵³ European Commission (2020), Study to Support Preparation of the Commission's Guidance for Extended Producer Responsibility Schemes, accessed 8 June 2020, https://ec.europa.eu/environment/waste/studies/pdf/DG%20Env%20EPR%20Guidance%20-%20Final%20Report_FOR%20PUBLICATION.pdf

A proposal was submitted by the Municipality of Trikala along with the Association of cafes/restaurants/canteens of Trikala²⁵⁴ to the Committee "Greece 2021"²⁵⁵ for the project 'Starting a small revolution for the environment' ('Ξεκινώντας μια Μικρή Επανάσταση για το περιβάλλον...')²⁵⁶.

The aim of this program is the reduction of the use of coffee packaging and plastic bottles, and consequently the decrease of the environmental footprint of the citizens and visitors everyday living in the Municipality of Trikala. According to data from the engagement with the Municipality of Trikala, for the successful implementation of the proposed action, the cooperation with the Ministry of Environment and Energy is necessary in terms of setting the proper institutional framework regarding the plastic beverage bottles as well as the development of a return system. The project also includes public awareness activities and a competition regarding the design of a reusable cup.

- **Product design and development (Coca Cola Hellenic Bottling Company)**



CCHBC has launched a wide range of initiatives to address changes in product policy. Specifically:

- Use of rPET in water and soft drink containers (implementation of SUP Directive);
- Zero landfill plants;
- Lightweight packaging – reduction of packaging materials;
- Higher than 90% of returnable glass bottles.

- **Collaboration – training fishermen to collect plastic from sea**



Enaleia is a social enterprise which trains fishermen to collect plastic from the sea. Nestlé has announced its support for the "Mediterranean Cleanup" marine plastic waste cleaning program developed by "Enaleia", the first professional fishing school in Greece²⁵⁷. This program includes the removal of marine litter with the cooperation of professional fishermen and their fishing boats, focusing on the Argosaronikos which is particularly overcrowded. The waste is collected and

²⁵⁴ Σύλλογος Καταστημάτων υγειονομικού ενδιαφέροντος Δήμου Τρικάλων

²⁵⁵ <https://www.greece2021.gr/en/>

²⁵⁶ <https://trikalacity.gr/parathyro-sto-mellon-apo-ton-d-trikkaion-kai-tin-epitropi-ellada-2021/>

²⁵⁷ <https://startupper.gr/vipnews/56620/i-nestle-synergazete-me-tin-enalia-sto-programma-mediterranean-cleanup/>

transported to Ichthyoskala Keratsini and Lavrio, in specific storage areas, in order to be recorded and sorted.

The program follows a circular economy model, as in addition to the collection and sorting of waste, it includes their recycling and conversion of some of them - those who meet the requirements in terms of material - into new items. During the October 2018 - May 2019 fishing period, 10 fishing boats cleaned 16 t of marine litter, from which 83% was plastic and 5,000kg of fishing nets were upcycled.