EUROPEAN
COMMISSION

Brussels, 28.5.2018
SWD(2018) 254 final

PART 1/3

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT

Reducing Marine Litter: action on single use plastics and fishing gear

Accompanying the document

Proposal for a Directive of the European Parliament and of the Council on the reduction of the impact of certain plastic products on the environment

{COM(2018) 340 final} - {SEC(2018) 253 final} - {SWD(2018) 255 final} -
{SWD(2018) 256 final} - {SWD(2018) 257 final}

Contents

1. INTRODUCTION

Plastics play an important role in our economy and daily lives but the way it is currently produced, used and discarded harms the environment. The amount of marine litter in oceans and seas is growing, to the detriment of ecosystems, biodiversity and potentially human health causing widespread concern. At the same time, valuable material that could be brought back into the economy is lost, once littered. The potential economic and environmental benefits of a more resource-efficient and circular approach are not realised. The need to tackle these problems and reduce the environmental, economic and social harm is widely recognised.

Being widely available, persistent and used for applications prone to littering plastic[1] is the main source of marine litter as it is hardly biodegradable and it can have toxic and other harmful impacts. Due to its persistency, these impacts are growing as each year we generate more plastic waste. It is a global problem as acknowledged by many initiatives worldwide[2] but Europe is a source and suffers the impacts.

In addition to harming the environment, marine litter damages activities such as tourism, fisheries and shipping. For instance, the cost of marine litter to EU fisheries is estimated at between 1%[3] and 5%[4] of total revenues from catches by the EU fleet. It threatens food chains, especially seafood.

Europe has a responsibility to deal with its part of the problem and committed to act globally. As part of the Plastics Strategy, the European Commission committed itself to look into further action to address plastic marine litter that builds on the piecemeal efforts underway in EU Member States. The problem of marine litter is transboundary by nature, as litter moves in the marine environment and litter originating from one country can affect another. Joined-up action is needed, also to ensure a single market with high environmental standards and legal certainty for businesses. This Impact Assessment supports a legal initiative aiming to reduce marine litter, as part of a wider approach:

1. **This initiative is an integral and complementary part of a much wider, comprehensive approach**, namely the Plastics Strategy, the Circular Economy Action Plan and the revised waste legislation.

   The Plastics strategy already tackles the design part of the cycle, for example, through a review of the essential requirements of the Packaging Directive. The strategy pushes an ambitious approach for plastic packaging recyclability, in line with our revised

[1] 'Plastic' shall mean a polymer, within the meaning of polymer as defined by Article 3(5) of Regulation (EC) No 1907/2006 of the European Parliament and of the Council, to which additives or other substances may have been added

[2] Such as the UN Global Partnership on Marine Litter; action plans put forward by the G7 and the G2; the international 'Our Ocean Conference', which the Commission hosted in October 201; a Resolution adopted at the third United Nations Environmental Assembly (UNEA) held in Nairobi (4-6 December 2017).

[3] Acoleyen et al. (2013)

[4] Marine Anthropogenic Litter, Editors: Bergmann, Melanie, Gutow, Lars, Klages, Michael (Eds.), 2015 Springer, ISBN 978-3-319-16510-3

waste legislation. It also includes a strong response on microplastics, a significant source of marine pollution. The revised Waste Framework Directive has strengthened general principles and objectives; ambitious 2030 recycling targets for municipal waste and plastic packaging are also set; however these can be reached without in depth efforts on littering or waste prevention.

The legislative initiative that this Impact Assessment accompanies complements all of these actions on design, recycling and microplastics and goes one step further. The main objective is prevention – reducing plastic marine litter of single use plastic and fishing gear e.g. by market restrictions and producers paying for clean-up. As a result, innovation for new business models (such as reuse models), multi-use items or material substitution will be boosted. In cases where marine litter will still occur, the resulting shift from single use plastics to reusable solutions and many natural, untreated alternative materials should lead to a reduced environmental impact. The initiative also tackles lost fishing gear because of its direct pathway to the sea. The main objective here is to incentivise bringing all fishing gear ashore and improve its handling there.

2. **It is a targeted and proportionate initiative** that directly addresses the two main sources of marine litter in Europe – i) single use plastics and ii) fishing gear. Together, these constitute 84% of plastic marine litter items[5], among them the most environmentally harmful items in the marine environment. Non-plastic marine litter is often inert (stone) or biodegradable (paper, wood) and thus poses a lower environmental threat.

i. **Single use plastics ("SUP")**, i.e. plastic packaging or other consumer products made of plastic that are designed to be used once, often away from home, and thrown away after a brief use. These items are particularly litter prone. Single use plastics include small packaging, bags, disposable cups, lids, straws and cutlery. The top 10 most commonly found SUP makes up 86% of all SUP in beach litter and is responsible for more than half of *plastic* marine litter. This list has been stable in recent years and over different regional seas within Europe. The list is very similar to lists in the US and other countries that consistently find the same SUP in their marine litter. Whilst the dominance of this top 10 is stable, legislation will have a review clause allowing for possible changes in the products or measures covered.

ii. **Fishing gear** (more precisely fishing and aquaculture gear) that is either lost or abandoned, including nets, makes up around a third of beach plastic litter by count and a higher proportion by weight. Abandoned, Lost or Disposed of Fishing Gear (ALDFG) includes:

- larger parts of fishing gear (such as pots and traps, nets, or lines) that are voluntarily abandoned on fishing grounds or accidentally lost due to adverse weather conditions, interactions and conflicts between gear users. These may entangle marine life ("ghost fishing") (such as pots and traps, nets, or lines) with worn out gear material (netting, lines) voluntarily dumped overboard

[5] Based on JRC analysis and further data analysis provided by Eunomia

rather than properly disposed of in port to avoid nuisance or cost related to handling this waste.

- fragments of gear (ropes, nets, etc.) or personal equipment, packaging, monofilament fishing lines, resulting from fragmenting or from normal fishing activities and maintenance of fishing gear and other equipment that are washed or thrown overboard.
- Fish Aggregating Devices (FADs), which are a special category of fishing device, extensively used for tropical tuna fishing, including by EU fleets[6].

3. **Member States are taking national action against single use plastic.** France has banned plastic cups and plates, Italy and France are banning plastic cotton buds, the UK wants to ban straws, joined by the Brussels region recently, and other countries like Ireland and Portugal are considering measures. The EU must act now to ensure these diverse actions do not fragment the single market. Businesses need a level playing field, with clarity and legal certainty, and the possibility to develop economies of scale for new markets and alternative materials.

Legal context

In 2015, the Circular Economy Package included proposals modernising the EU waste legislation on which an agreement between the Institutions was reached in December 2017. The new legislation includes general provisions on waste prevention and marine litter.

On 16th January 2018, the Commission adopted the "European Strategy for Plastics in a Circular Economy"[7] which recognises that marine litter remains an issue and that plastic is a significant source of pollution. It sets out, in its action plan, that additional action on fishing gear, including Extended Producers Responsibility and/or deposit schemes will be examined.

The Common Fisheries Policy Control Regulation[8] contains measures on retrieval and reporting on lost fishing gear, as well as the requirement to mark fishing gear. The European Maritime and Fisheries Fund (EMFF)[9] allows Member States to financially support the collection of marine litter as well as invest in port facilities for waste collection.

The Commission's 2018 legislative proposal on port reception facilities[10] includes measures to ensure that waste generated on ships or gathered at sea be returned to land and adequately managed. It refers explicitly to the Commission's consideration for further action on fishing gear. In spring 2018, the Commission will adopt a proposal for a review of the Fisheries

---

[6] It is considered that 65% of all the purse seine sets made globally are on FADs (both by distant fishing nations and coastal states). Setting on FADs accounts for nearly 40% of global tuna catches and 50% of global skipjack catches.

[7] COM(2018) 28 final

[8] Council Regulation (EC) No 1224/2009 of 20 November 2009 establishing a Community control system for ensuring compliance with the rules of the common fisheries policy.

[9] Regulation (EU) No 508/2014 of the European Parliament and of the Council of 15 May 2014 on the European Maritime and Fisheries Fund.

[10] Proposal for a Directive of the European Parliament and of the Council on port reception facilities for the delivery of waste from ships, repealing Directive 2000/59/EC and amending Directive 2009/16/EC and Directive 2010/65/EU, COM/2018/033 final - 2018/012 (COD).

Control System[11], which will improve the rules on reporting of lost fishing gear, e.g. through the introduction of e-reporting, and on its retrieval.

Public context

The public is sensitive to the environmental impact of plastics. Eurobarometer surveys found that 74% of European citizens are concerned about the impact on their health (74%) and on the environment (87%) of everyday products made of plastics. Documentaries such as A Plastic Ocean[12] or BBC Blue Planet II[13] brought the dimension of this global problem to attention of a wider public. 33% of Europeans identified marine pollution as the most important environmental issue[14].

The implementation of the Plastic Bag Directive[15] shows that restrictive measures can bring immediate results and public acceptance. Its implementation shows that even small levies on light plastic bags (around 0.10€) can lead to significant reductions in consumption in a short period. In Ireland the introduction of a tax on plastic shopping bags resulted not only in a 90% reduction of plastic bags provided in retail outlets (Convey et al., 2007) but also in a marked decline in bags found on beaches, from an average of 18 plastic bags/500m in 1999 to 5 in 2003[16].

The public consultation, that took place between December 2017 and February 2018, received more than 1800 contributions and showed that both with the wider public and with stakeholders there is an awareness of the need for action on Single Use Plastics 98.5% of respondents consider that action to tackle single use plastic marine litter is “necessary”, and 95% consider it “necessary and urgent”. More than 70% of manufacturers and more than 80% of brands and recyclers considered action "necessary and urgent". Legal clarity, and investment certainty over a unified single market is essential to all businesses involved in the plastic value chain

[11] At the time of drafting this document, this initiative was only planned but not yet adopted.
[12] https://www.plasticoceans.org/about-film
[13] http://www.bbc.co.uk/programmes/p04tjbtx
[14] Special Eurobarometer 468 (EC, 2017) 27,881 EU citizens from 28 Member States were interviewed between 23 September and 2 October 2017
[15] Directive (EU) 2015/720
[16] According to Coastwatch beach monitoring data, p.32 in http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/MSFD_identifying_sources_of_marine_litter.pdf

2. PROBLEM DEFINITION

2.1. The problem

Marine litter is found on beaches and in the seas. It causes economic, social and environmental damage. The "plastic soup" that forms in the oceans endangers ecosystems and biodiversity and potentially human health; notably through plastics in the food chain. Socioeconomic impacts include clean up and retrieval costs, damage to tourism, shipping, fishing and aquaculture as well as the loss of valuable resources that could be reinjected into the economy. In the North Sea, 93% of the fulmars (marine bird species) analysed have ingested plastics. In a recent EU-funded project, covering the Mediterranean and Northeast Atlantic, 150 turtles have been analysed, 85% of the 120 individuals contained ingested litter, at an average of 1.3 g and 16 items[17].

While the problem is global, it has a clear European dimension. South East Asia is the largest source of marine litter but Europe is also a significant source, it both suffers the consequences and pollutes other regions including the Artic[18]. Not all marine litter in European seas or beaches originated in the European Union[19], although European sources are significant (see Annex 3). Plastics are found on all beaches of European Seas. The majority of items found on a beach in Texel, the Netherlands, originated from the Netherlands or neighbouring regions[20]. European countries bordering the Baltic and North Sea are likely to be the origin of plastic found there but, of course, all plastic coming from Europe either ends up in Europe's waters or in waters elsewhere in the world. Indeed, marine litter can travel large distances, even as far as the Artic[21].

The problem is marine litter found on beaches, on the seabed and floating. Most plastic floats, but some plastic items, such as fishing nets and bottles, end up at the bottom of the sea. Marine litter moves around thanks to currents, weather and degradation, from seabed to sea surface to beaches. What you see on the beach is a reasonable indicator for what is found at sea (floating and non-floating) as well.

2.1.1. What types of marine litter do we find?

The identification of the origin, pathway and type of marine debris can be difficult, as litter degrades and fragments over time. Some plastics enter the marine environment as 'macro plastics' and then degrade slowly into smaller fragments. Others enter directly in the form of microplastics, which are plastic particles with a diameter less than 5mm. Some of these microplastics are intentionally added to products (e.g. scrubbing agents in cosmetics, detergents, paints) or to serve as input for further processing (e.g. plastic resin pellets). Others originate from the abrasion of large plastic objects during manufacturing or use (e.g. tyre dust, textile fibres). The Plastics Strategy already includes specific measures on micro

[17] Matiddi et al. 2017: http://dx.doi.org/10.1016/j.envpol.2017.06.054
[18] https://www.marinetechnologynews.com/news/arctic-floating-plastic-547464
[19] Obviously, this is particularly true for the outermost regions that are surrounded by third countries, in particular in the Caribbean Sea.
[20] Van Franeker (2005)
[21] https://www.marinetechnologynews.com/news/arctic-floating-plastic-547464

plastics: restrictions through REACH for deliberately added microplastics in products as well as for micro plastics from other sources (tyres, textiles and plastic pellets)[22]. **This initiative hence focusses on single use plastics and fishing gear,** which are macro-plastics**.**

Percentage contribution to beach litter can be calculated by item count, weight, volume, or surface area/volume ratio. Beach litter item counts are internationally accepted as a reasonable indicator of the composition of marine litter, and as suitable to inform policy. Similar counts lead to similar results in terms of beach litter composition internationally (notably in US, Australia, Korea, Taiwan, Japan). In the EU, guidance is available[23] to support monitoring and will be further improved by a 2017 Commission Decision on criteria and standards for determining Good Environmental Status[24].

A representative sample of European beaches was used to establish a database of marine litter from 276 beaches of 17 EU Member States and 4 Regional Seas during the year 2016. The 355.671 items observed are ranked by abundance. Litter on beaches has been monitored for a number of years (for instance more than 10 years in the Northeast Atlantic). Annex 3 contains details, a discussion of the statistical robustness and an analysis of litter found by regional seas.

While there are differences between what is found on beaches and what is found in the seas, the two are linked and available evidence suggests that **litter counts on beaches is a reasonable indicator of marine litter in general**[25]. In more detail:

- The regional seas analysis suggests that a single list of litter items is suitable for a European policy approach, as opposed to different policy approaches by regional sea. While there is some **regional variation**, the top ten items-by-count found on beaches changed very little even if rankings differ.
- Counts reflect the **potential impact of marine litter** as marine species and activities are more affected by the number of items found than by weight (see Section 2.1.2).

The accuracy of beach litter as a proxy for total marine litter **in all compartments, floating and non-floating** (i.e. beach, surface, water column, sea floor), varies according to the sea and its tides as well as the products and pathways. Depending on ocean currents and beach situation, the coasts accumulate litter from the sea or they act as a reservoir for washed-up litter. Small items resulting from the breakup of fishing gear over time are more likely to end up onshore; large items are more likely to end up on the sea floor. Some plastic sinks, and then can reappear due to tides and currents. Seafloor samples show higher proportions of fishing gear than is found on beaches, particularly those with little tidal range. Beach litter is

[22] Public consultation investigating options for reducing releases to the environment of microplastics https://ec.europa.eu/info/consultations/public-consultation-investigating-options-reducing-releases-environment-microplastics_en

[23] "Guidance on Monitoring of Marine Litter in European Seas", JRC

[24] Commission Decision (EU) 2017/848 of 17 May 2017 laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardised methods for monitoring and assessment, and repealing Decision 2010/477/EU

[25] See Annex 3 for more detailed discussion

therefore a better indicator for the types of SUP litter than for sea-based activities but is reasonable for both.

2.1.2. Measuring SUP in item counts versus weight

Measuring by item counts is the chosen option for this Impact Assessment, as it is the best indicator for the overall environmental, social and economic impacts. However, no type of measurement is perfectly correlated with all the different types of impacts:

- Environmental impacts are varied, from harm to wildlife by entanglement and ingestion, harm to ecosystems through smothering, abrasion and the spread of invasive species, and effects on the movement of persistent organic pollutants (POP) within and between habitats as well as in the food chain. The number of items is fairly closely related to ingestion by marine fauna (fish, birds, reptiles, some mammals), as well as microplastic generation in the short term (many smaller items with a larger surface area to volume ratio will wear and degrade faster – over years and decades - than dense items of large mass).
- For fishery related items harm is caused by "incidents" i.e. encounters between wildlife and lost fishing gear. Therefore, the number of fishing gear litter items is of relevance. Of course, a bigger net can cause more harm. While there is still little information about seafloor litter, the available trawling data from areas surveyed by video[26] confirm the existence of litter in the deepest areas and at locations very remote from land.
- Measuring by count is a reasonable way to indicate the impact on tourism: the aesthetic disturbance by litter, related to the acceptance by tourists, does not depend on the individual litter properties (with some exceptions, if particularly unhygienic or dangerous) but more on the number of visible items.

Tonnage of items is best correlated with the generation of microplastics over the long term (hundreds of years) and subsequent ingestion at all levels of the food chain including the lower levels such as invertebrates, with the associated POP related impacts. Additionally, the quantitative units listed above do not capture other features, such as shape (ability to lacerate, trap or entangle), location of emissions (whether item also has accrued terrestrial litter impacts) or likelihood of ingestion (related in turn to shape, colour and material type), which cannot be easily in an objective way.

While item counts are opted for in this Impact Assessment, analysis was also undertaken to explore the data using weights, rather than counts. Doing so, plastic marine litter is dominated by a few heavy multi-use sources such as tyres, shoes, and car parts. Those items would require a different policy approach as some of it is related to negligence, and some rather to deliberate waste dumping in the sea, for which better enforcement of existing legislation would be the appropriate response.

[26] Pham at al. 2014: https://doi.org/10.1371/journal.pone.0095839

The analysis also needs to be seen in the perspective of the overall figures on plastics marine litter, as shown in the Table below[27]. Microplastics form a major part (in weight) of plastics marine litter. Concentrations are increasing, but there is no overall mass balance of transfers between coasts, rivers, shipping and the sea on a European or global scale. Microplastics are tackled by specific actions under the Plastics Strategy (as discussed in Section 2.4).

The focus of this initiative is on the approximately 27,000 tonnes of plastic from fishing gear and SUP that enter the marine environment each year. This focus has been chosen, because SUP are:

- The source of plastics marine litter that the existing legislation in its current form does not address fully, and so there is a legislative gap; and
- Highly harmful to environment, with a significant negative social and economic impact; a mere weight-based approach would not demonstrate this harm and impact.
- Abandoned and discarded fishing gear is highly harmful.
- Current and proposed legislation and other measures covering fishing gear[28] presuppose more targeted measures, including the development of an appropriate waste as well as reuse/recycle stream adapted to its specific characteristics.

Table 1. Estimations of weight of marine plastics litter, per year, per source, in the EU

Plastics marine litter	Tons	Source
Total	150.000 – 450.000	Eunomia (2016), based on Jambeck *et al.* (2015)[29]
• Microplastics	75.000 – 300.000	Eunomia (2018), published
• Macroplastics:		
- Single use plastics	15.600	Eunomia (2018), in preparation
- Fishing gear	11.000	See annex 7

2.1.3. How big is the contribution of SUP and fishing gear to plastics marine litter?

Plastics makes up 80-85% of **marine litter** by count. The non-plastic part (15-20%) is often inert (e.g. construction material) or biodegradable (e.g. paper, wood) and therefore has a lower environmental impact. About half of identifiable plastic pieces are 'single use plastics' (e.g. crisps packets, cotton bud sticks etc.).

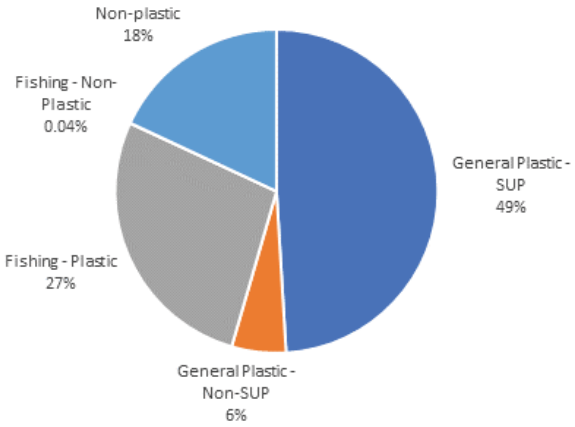
Of the plastic part, around 30% remains unidentified, but probably has a similar composition as the identifiable part. This means that that SUP makes up around half of all beach litter items counted. Plastics from fishing gear makes up another 27% of marine litter items.

[27] It should be underlined that all figures are estimates with a considerable margin of error but that this is particularly the case for microplastics. Also, estimates come from different sources, using different methodologies that are not always consistent. Indeed, as part of the underlying analysis for this Impact Assessment the estimates for plastic marine litter have changed noticeably from the figures available a few years ago.

[28] COM (2018) 33 final, COM (2018) 28 final (PRF Directive proposal, and plastics strategy, respectively)

[29] Jenna R. Jambeck et al. (2015), Plastic waste inputs from land into the ocean, Science, 347 (6223), 768-771 (DOI: 10.1126/science.1260352)

Figure 1. Composition of Marine Litter (items)



Source: Eunomia, based on JRC data

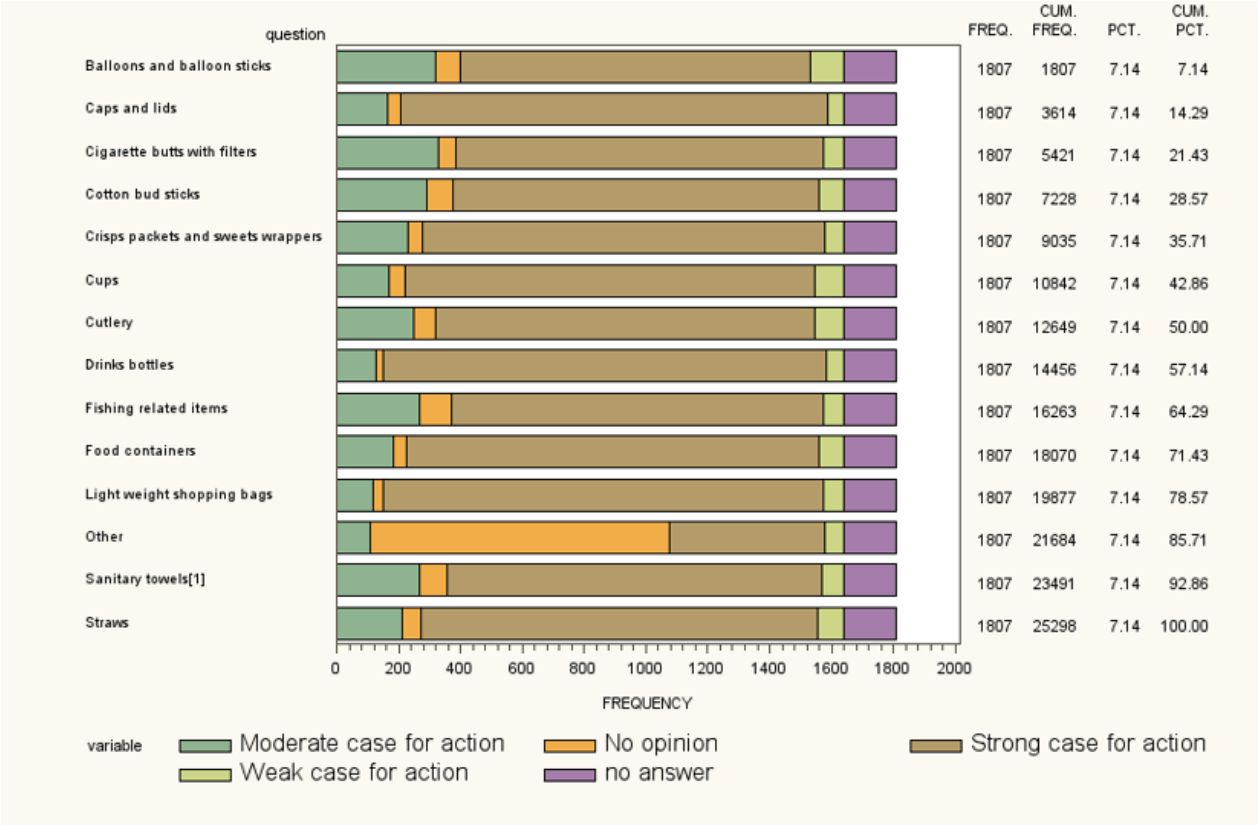
The top 10 most found of the SUP are 86% of the number of all SUP items found on the beaches (which can be expressed as 43% of all marine litter or half of all the plastic items). This approach thus excludes only 14% of the SUP items. Adding more items, would mean chasing very small sources: number 11on the list is shotgun cartridges. The way and methodology for the aggregation of the items are extensively explained and discussed in Annex 3. Also, looking at items 11 onwards, they are not just small in count and so in environmental damage potential, but a number of them do not have clear alternatives available making policy responses less obvious. To refer to a limited list of items (Top 10) also makes it easier to communicate the relevant policy measure to the public. **The categories of SUP listed in Table 2 below are the basis of further analysis.**

Table 2. Sampling numbers of top ten SUP items

Ranking	Item	Total number
1	Drinks bottles, caps and lids	24,541
2	Cigarette butts	21,854
3	Cotton buds sticks	13,616
4	Crisp packets / sweet wrappers	10,952
5	Sanitary applications	9,493
6	Plastic bags	6,410
7	Cutlery, straws and stirrers	4,769
8	Drinks cups and cup lids	3,232
9	Balloons and balloon sticks	2,706
10.	Food containers including fast food packaging	2,602

The Public Consultation[30] demonstrated that public concern about plastic items is closely aligned with the top 10 list. Concern was expressed for all items, but with priority given to caps and lids, drinks bottles, cups and straws.

Figure 2. Responses to the Question – For each type of plastic litter, and fishing gear, *"to what extent do you agree that action should be taken to reduce their presence in the environment?"*



Marine litter from sea-based activities is also significant. Any plastic waste lost from marine transport, offshore platforms, recreation, fishing or aquaculture will enter the marine environment[31]. The Impact Assessment[32] for the revision of the Directive on Port Reception Facilities[33] found that much waste from ships, including fishing vessels and recreational craft, that should be delivered to ports is not (up to 30%) and may end up being discharged at sea. The greater part however comes from fishing and aquaculture. This is reflected in the largest single category of beach litter items being strings and cords, which largely come from fishing gear.

[30] https://ec.europa.eu/info/consultations/reducing-marine-litter-action-single-use-plastics-and-fishing-gear_en

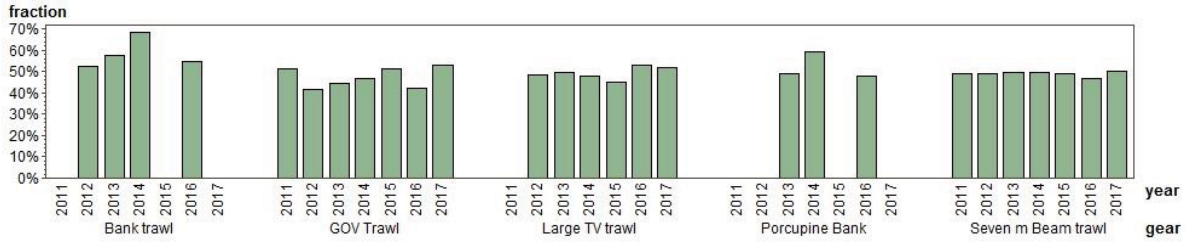
[31] Only around 2,000 of the at least 80000 boats that reach their 'end of use' each year in Europe are dismantled, a significant number of the remaining boats are left abandoned, potentially ending up in the ocean and becoming marine litter (Commission Staff Working Document on Nautical Tourism, SWD(2017) 126 final).

[32] SWD(2018)21

[33] Directive 2000/59/EC

The proportion of items from sea-based activities on beaches with strong tides[34] is higher, suggesting that the proportion in the water may be even higher. An analysis of what has been brought up in fishing nets in western Atlantic and the Baltic indicates equal numbers of items coming from fishing as from single used plastics. The majority of plastic found in Arctic waters derives from fishing[35].

Figure 3. Density of plastic items per unit area from fishing as proportion of the total number from single use plastics and fishing gear



Source: ICES DATRAS database and analysed by EMODnet

A complementary approach to beach counts and counts following retrieval actions from the sea floor was to calculate the fishing gear contribution to waste and to marine litter based on sector statistics based on production statistics from the PRODCOM database and sampling. The total loss of plastic waste (netting and non-netting) from fishing gear and aquaculture is estimated at 11,000 tonnes per year (see annex 7). For comparison, the input from single use plastics are estimated at 15,604 tonnes per annum.

Finally, plastic pollution is also found in freshwater and soil. Riverine litter is a contributor to marine litter: the available evidence shows strong similarities in the composition[36].

How future proof is this selection – consistency over time and place

The top 10 SUP items are the ones that are consistently found in beach counts in Europe, over recent years and over the different seas. In the various samples, the exact number of counts and order within the top 10 might change, but not the top 10 as such.

Currently at EU level, only one specific SUP item is regulated, namely plastic bags, through the Plastic Bags Directive. At Member State level, most of the items that are (or are planned to be) regulated are part of the top 10. The notable exception is plastic plates, which counts for only 0,02% of the items found on beaches and is not seen as significant at the EU level.

[34] Unger and Harrison "Fisheries as a source of marine debris on beaches in the United Kingdom" Mar Pollut Bull. 2016 Jun 15;107(1):52-58.

[35] Ingeborg G. Hallanger and Geir W. Gabrielsen, 2018 Plastic in the European Arctic 045 Norwegian Polar Intituite Brief Report

[36] JRC Technical Report “Riverine Litter Monitoring - Options and Recommendations”, 2016

Table 3. Items examined or addressed in Member States or regions

Member State/Region	Item
France	Cups, glasses, plates, cotton buds
Italy	Cotton buds
Italy	Cigarette buds
Scotland	Cotton Buds
Scotland	Straws
Spain – Balearic Islands	Single use consumer plastics, e.g. cups, plates, cutlery, straws; wet wipes, bottles
Brussels region	Straws
Ireland	Single use plastics: coffee cups, plastic cutlery etc.

An American study[37] found broadly the same list of items. The authors argue that action should be focused on this list, as these are the plastic applications that cause the most harm in America. Of the EU Top 10 only plastic cotton buds are not found in the US list, as these products are mainly made of hard paper in the American market (and thus are biodegradable).

A comparison of actions taken globally shows a diverse list, but most items from the EU Top 10 are included, in particularly plastic bags, cutlery, wipes and food containers (sometimes referred to Styrofoam or Polystyrene), straws, cups. The list of items addressed around the world (Annex 3, Section 4.1.4) is thus similar to the EU Top 10. Ultimately, the top 10 list of items found through beach counting, seabed trawling etc. will change due to the actions that will be taken. Some items should disappear, which would be a sign of success. The upcoming legislation will foresee the possibility to evaluate the effectiveness of the measures taken and the items that are recorded as marine litter on our beaches. In order to be future-proof, the legislator can then change the list of items, actions or targets as necessary (see Section 8). Similarly, it is important that legislation avoids regrettable substitution, hence the need to closely follow scientific and technical developments to understand when it will be possible to develop clear criteria for marine biodegradability.

2.1.4. The impacts of marine litter

Marine plastic litter persists in the environment, and there is a continuous build-up. It is not possible to remove all the marine litter as the seas and oceans have a combined surface of 350 million km² and a volume of 1.300 million km³. Marine litter harms the economy, society and environment in different ways. UN Environment estimated the total natural capital cost to marine ecosystems of plastic littering damage at USD 13 billion per year[38].

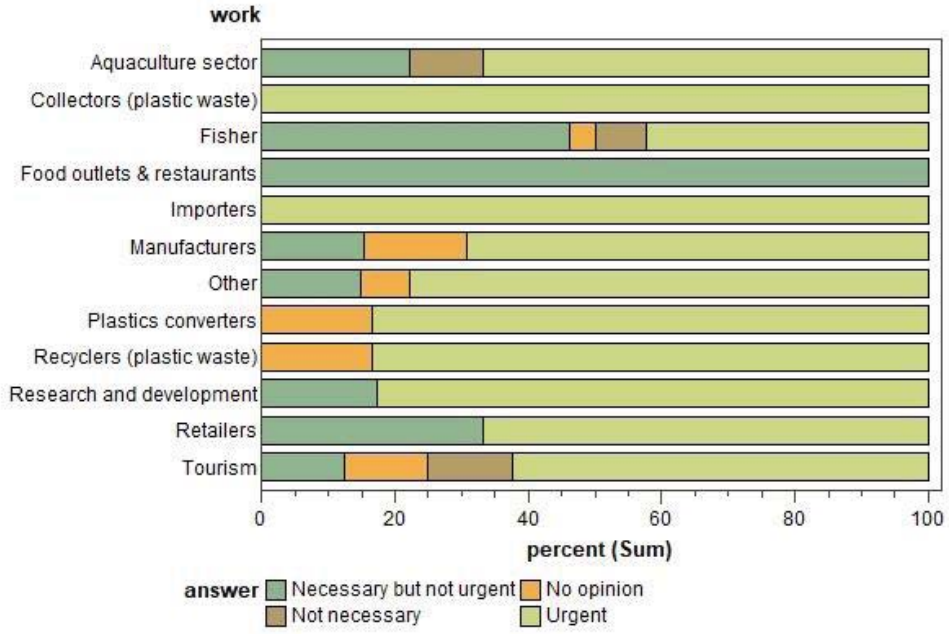
The JRC Report on "Harm caused by marine litter" (2016), summarises the impacts as: *"Marine litter impacts organisms at different levels of biological organization and habitats in a number of ways namely: through entanglement in, or ingestion of, litter items by individuals, resulting in death and/or severe suffering; through chemical and microbial*

[37] www.5gyres.org
[38] UNEP (2014) Valuing Plastics: The Business Case for Measuring, Managing and Disclosing Plastic Use in the Consumer Goods Industry"

transfer; as a vector for transport of biota and by altering or modifying assemblages of species. Marine litter is a threat not only to marine species and ecosystems but also carries a risk to human health and has significant implications to human welfare, impacting negatively vital economic sectors such as tourism, fisheries, aquaculture or energy supply and bringing economic losses to individuals, enterprises and communities."

There is a consensus amongst all stakeholders that something needs to be done, with a majority believing that the issue is urgent (see Figure 4).

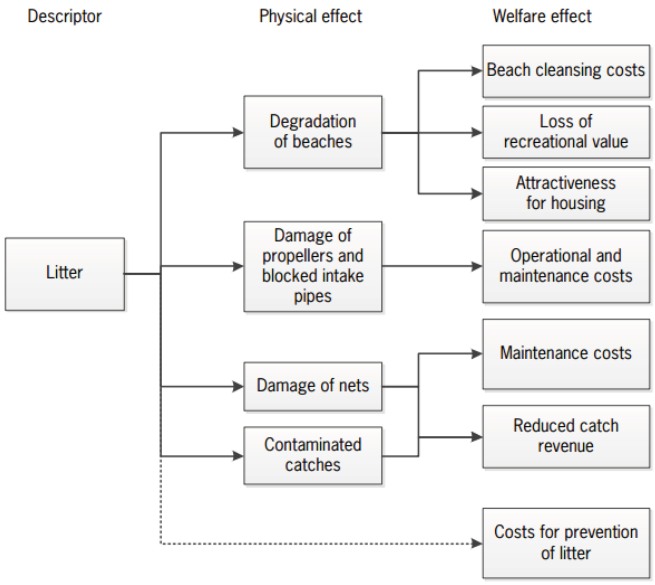
Figure 4. Answers in open stakeholder consultation to question "*Please indicate whether you think action to address the amount of marine litter (including fishing gear) in the seas and on beaches is:*"



2.1.4.1. Economic impacts

Marine litter damages business in economic sectors such as tourism, fisheries, aquaculture, navigation and energy as well as the respective local communities.

Figure 5. "Logical Diagram of Impact"



Source: JRC, 2016, "Harm caused by marine litter"

The economic impact on the most obvious affected sectors is described below:

- **Fisheries and aquaculture**
  - The removal of litter from nets, as well as the damage caused to the catches themselves can lead to a significant reduction of catches, as well as time and costs associated with repairing fishing gear damaged by marine litter; entangled propellers and obstructed cooling systems. Lost or abandoned fishing gear can continue to fish ("ghost fishing"). This can lead to a direct catch reduction in its vicinity and, cumulatively, the risk to reduce affected fish stocks' abundance. Furthermore, litter near fishing grounds and aquaculture cages can damage the image of the seafood produced. At the European level, Acoleyen et al. (2013) estimated that the costs due to damage and losses reaches approximately €61.7 million, equivalent to a reduction of nearly 1% of the total revenue generated by the EU fleet in 2010. Other sources[39] put the level at 5%.
- **Shipping and ports**
  - Marine litter and ALDFG can create navigation hazards that can cause accidents at sea, damage boats and pose a threat to navigation safety e.g., through blockages of ship propellers and entanglement of divers.
  - Over 71% of harbours and marinas surveyed in the UK reported that their users had experienced incidents such as fouled propellers, fouled anchors, fouled rudders and blocked intake pipes and valves. Marine litter costs the ports and harbours industry in the UK around €2.4 million each year (implying costs for the EU as a whole of around €30 million each year).

[39] Bergmann, Melanie, Gutow, Lars, Klages, Michael (Eds.), 2015. Marine Anthropogenic Litter, Springer

- **Clean-up activities.** Targeted clean-ups of floating marine litter or litter deposited on the sea- floor are restricted to scattered initiatives and programmes. These are, in most cases, voluntary-based or funded by private entities, local authorities[40] or the EU. For example, the current European Maritime and Fisheries Fund envisages the investment of €22 million for support of fishing for litter operations over the period 2014 to 2020. In comparison to the previous funding period, the number of Member States planning 'fishing for litter' operations doubled compared to those undertaken in the European Fisheries Fund. The number of planned operations increased by 130% and the planned EU funding by 320%.
- **Coastal communities and tourism.** There are economic costs to coastal municipalities in the form of the costs of keeping beaches clear of litter and its wider implications for tourism and recreation, as litter puts tourists off from visiting and from sea-based activities. Acoleyen et al. (2013) estimated that cleaning costs for the more than 50,000 kilometres of EU coastline amounted between approximately €194 and €630 million.
- **Long term impacts.** The damage to economic activities and the livelihoods of communities are known to a certain extent. However, the unknown unknowns are of far more concern. The long-term year-by-year accumulation of material in all levels of the food web poses an existential threat to these activities and these communities. There are about 150,000 fishermen in Europe. Another 60,000 people work in aquaculture and 120,000 in processing. Many more are employed in the retail and restaurant trades. Consumer concerns could cause major disruption well before the actual damage to human health is known as was shown when unfounded suspicion that Spanish cucumber was responsible for e-coli deaths in Germany caused Spanish farmers to lose $256 million[41].

2.1.4.2. Environmental and human health impacts of plastic marine litter

The impacts of plastic marine debris on the environment and human health are well documented and can be structured according to the size of the plastic litter[42], as explained in detail in Annex 3.

- Impacts of macroplastics (i.e. pieces of plastics larger than 5mm): ingestion, entanglement, "ghost" fishing, decreased biodiversity, sea floor pollution;
- Impacts of microplastics (i.e. pieces of plastics smaller than 5mm): ingestion or absorption, impact nanoparticles;
- Impacts of toxic substances associated with plastic debris: chemical toxicity, persistent organic pollutants

As explained above, the impact will be related with different features of the plastic waste such as weight, shape, location of emissions or likelihood of ingestion which are difficult to determine. There is no specific literature available yet that differentiates the impacts of the different items under examination in this impact assessment.

[40] http://www.kimointernational.org/fishing-for-litter/
[41] https://www.aljazeera.com/news/europe/2011/06/20116771510528902.html
[42] Eunomia, ongoing.

However, as all the items are frequently littered, their overall impact will be important. The model used calculates (table 27 of Annex 6) that the total amount of littering of the top 10 SUP items would be almost 7 billion items in 2030. Even the smallest group within the top 10 SUP, would be littered several million times in the European Seas. As an illustration, the smallest of the categories, stirrers, is still estimated to be contributing 17 million items a year in 2018, rising to 20 million in 2030, to the marine environment. Scenario 2c is modelled to reduce the 2030 estimate by 3.6-3.8 billion items. While these are modelled figures and should be carefully considered, they give an idea of the order of magnitude.

Whilst the impact of plastic marine litter is acknowledged, it is not possible to establish impacts for individual litter categories in a statistical way. For example, evidence may come from birds found dead on beaches or from turtles. Each of the Top 10 SUP items has been found to cause harm: besides monitoring of birds and turtles, there is anecdotal and empirical evidence (e.g. observations and photos), Moreover:

- only a small sample of incidents end up being visible on the beach;
- the identification of source can be difficult because of weathering and fragmentation, and so studies tend to report plastic more generally and not by type of item[43].

A survey of 340 academic papers produced the following summary of impacts on 693 species.[44] Notably, the debris categories were wider:

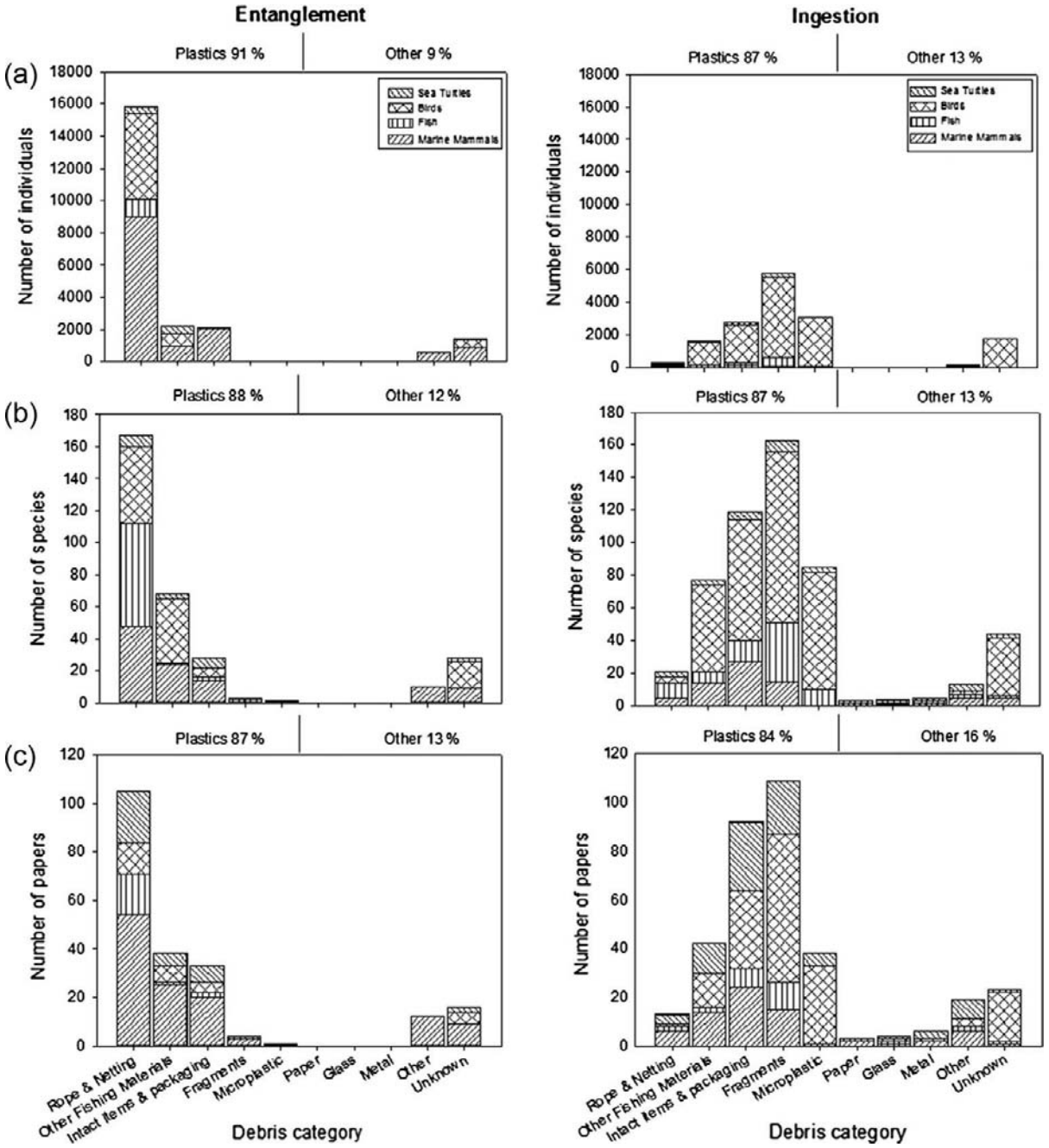
- Plastic: Rope and netting, other fishing materials, intact items and packaging, fragments, microplastic,
- Paper,
- Glass,
- Metal,
- Other,
- Unknown.

The result is that it is not possible to provide a statistical analysis of the relative harm caused by each of the Top 10 SUP items individually. An item may make up 5% of plastic marine litter, but it is not possible to say whether it causes more or less than 5% of harm; whilst it is possible to state that it accounts for a share of the overall harm. Given that even the least found items are found in their millions in the oceans, it seems reasonable to state that they are sufficiently harmful to warrant further analysis.

[43] A fulmar typically weighs 700g, with a stomach only a few cm across meaning that most plastic found in them will be broken up and in small pieces

[44] Gall, S.C., and Thompson, R.C. (2015) The impact of debris on marine life, *Marine Pollution Bulletin*, Vol.92, Nos.1–2, pp.170–179

Figure 6. Impact of various debris on marine life



Source: Gall and Thompson, 2015

There are however many cases where impacts have been demonstrated for specific items. For example: a case of a turtle having ingested a drinking straw which then became lodged in the animal's nostril[45]; a case of a plastic fork having been ingested by a turtle[46,47]; the review of

[45] https://news.nationalgeographic.com/2015/08/150817-sea-turtles-olive-ridley-marine-debris-ocean-animals-science/

[46] https://www.earthtouchnews.com/environmental-crime/pollution/first-a-straw-now-a-fork-turtles-are-choking-on-our-plastic-trash/

items found in whale stomachs, including bags, drinks cups, plastic caps as well as a host of other items[48]; images of Midway Island albatross[49] with plastic caps easily identifiable amongst ingested items; examples of balloon remnants found in fulmar stomachs[50]. These all demonstrate that even larger items are directly ingested whole in some circumstances.

It is therefore possible, on the basis of available literature and monitoring, to conclude that there is a differentiation in the degree of harm from each item. Table 1 reflects the impacts of the targeted top 10 items. Ultimately plastic macro litter, if it remains long in the sea, becomes microplastics, which facilitates ingestion by marine animals and entry in the food chain, as well as the release of chemicals. Aside the environmental impacts, there are also impacts on tourism (e.g. landscape degradation) and on the fisheries industry (e.g. litter removal, entanglement of propellers, ghost fishing, material loss through nets encountering).

Table 4. Assessment of the impacts of top 10 items

	Entanglement of marine wildlife	Ingestion by marine animal	Pollution of marine waters (chemicals release, microplastics)	Transport of invasive species (rafting)	Microbial contamination	Economic impacts on tourism	Economic impacts on fisheries	Potential human health impacts
Drinks bottles & caps	+	++	+	+++	+++	+++	+	+
Cigarette butts	-	+++	+++	+++	+++	++	++	+
Cotton buds sticks	-	+++	+	+++	+++	++	+	+
Crisp packets	+	+++	+	+++	+++	+++	++	+
Sanitary applications	+	++	++	+++	+++	+++	++	+
Plastic bags	+++	+++	+	+++	+++	+++	+++	+
Cutlery, straws & stirrers	+	+++	+	+++	+++	++	+	+
Drinks cups & lids	+	++	+	+++	+++	+++	+	+
Balloons & sticks	+	+++	+	+++	+++	+	+	+
Food containers	++	++	+	+++	+++	+++	++	+
Fishing gear	+++	++	++	+++	+++	+++	+++	+

Current evidence strongly suggests that, in addition to its impact on ecosystems, plastic marine litter constitutes a public health issue. Human beings could be exposed to micro- and nanoplastics in different ways, including through the food chain. The risk to human health will be further examined by ECHA following the mandate, given by the Commission, to prepare a REACH dossier on microplastics intentionally added to products.

---

[47] The mouth cavity of turtles is lined with tough, backwards facing spines to inhibit the escape of prey; however it means that the animals can egest things only with great difficultly and for this reason, items get lodged in their nasal cavities. http://seaturtleexploration.com/inside-of-a-sea-turtles-mouth/

48 de Stephanis, R., Giménez, J., Carpinelli, E., Gutierrez-Exposito, C., and Cañadas, A. (2013) As main meal for sperm whales: Plastics debris, Marine Pollution Bulletin, Vol.69, Nos.1–2, pp.206–214

49 http://www.chrisjordan.com/gallery/midway/#CF000313%2018x24

50 Andries, J., and Van Franeker, J. Plastic Soup is Everywhere https://www.wur.nl/upload_mm/0/b/2/020f791b-3b58-4f39-9f08-09924fa9b15d_PLASTIC%20LUNCH-UK.pdf

2.1.4.3. Natural resources and waste impacts

The design, production and use of single use plastic contributes to the depletion of natural resources and the increase of waste. This inefficiency of the current production, consumption and disposal patterns is reflected in the loss of valuable resources (e.g. between €70 and €105 billion of plastic packaging value lost to the global economy annually[51]). The continued use of oil as feedstock for plastics production complicates the efforts to phase out fossil fuel production and extraction and the emission of CO_2 linked to production and incineration of plastics (approximately 400 million tonnes of CO_2 a year globally)[52]. The inappropriate disposal of single use plastics is a further problem in this regard since a relevant percentage is not recycled nor easily recyclable.

Disposal and end-of-life treatment of fishing gear is low. The level of recycling in the EU is[53] 1 to 5%, low when compared to rates in countries such as Iceland and Norway[54].

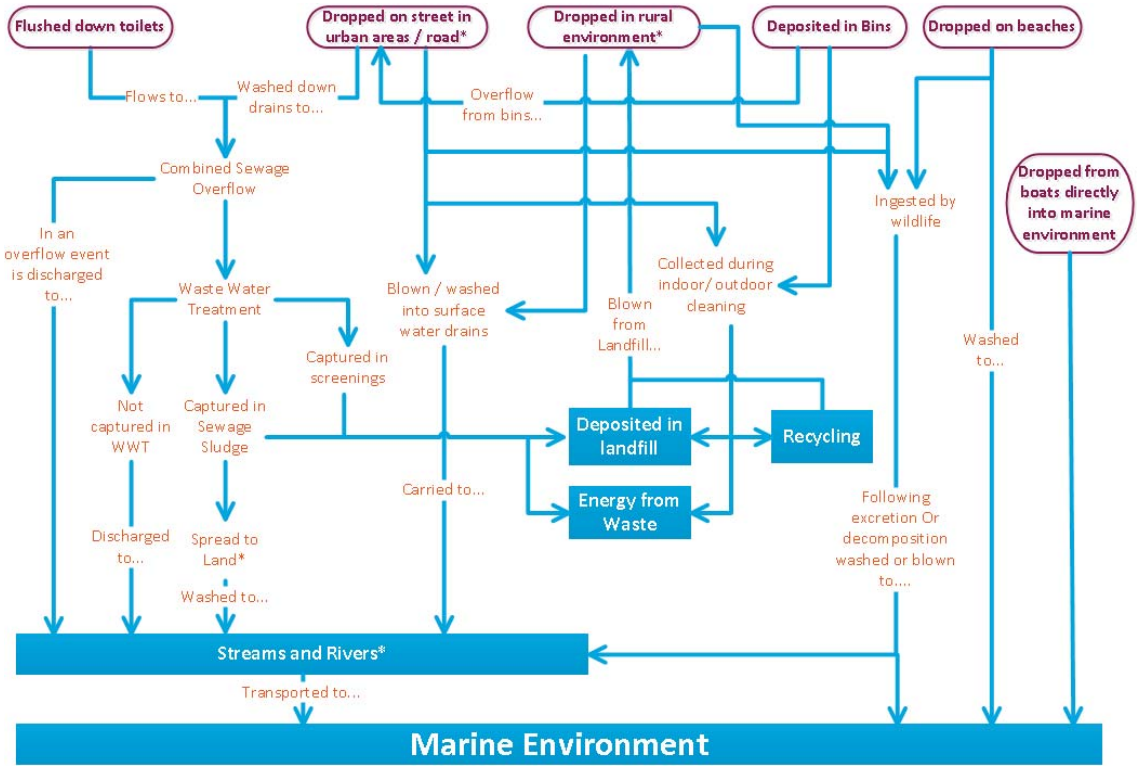
2.2. Marine litter pathways and drivers

2.2.1. Most likely pathways

Marine litter has a source (i.e. the sector or activity leading to marine litter), a means of release (i.e. reason for not being properly captured by waste management infrastructure), and a pathway and transport mechanism (i.e. means by which it enters the marine environment). To understand the terminology and provide an example, a cotton bud stick may be flushed down the toilet (means of release) by consumers (source) and enter the marine environment through the wastewater release system (pathway)[55]. Depending on the level of treatment but also on the organisation of the wastewater collection network, plastics could be captured or not[56]. Annex 3 includes a table with details for different types, and Figure 6 summarises this.

[51] World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company, The New Plastics Economy — Rethinking the future of plastics, (2016, http://www.ellenmacarthurfoundation.org/publications).
[52] Plastics Strategy, COM(2018) 28
[53] EUNOMIA (2017)
[54] EUNOMIA (2017)
[55] See JRC Technical Report "Identifying sources of marine litter", 2016 for analyses for different items
[56] Most cities have combined sewer systems where wastewater and storm water are drained in one sewerage system. During heavy rainfalls, volumes of flow are high and water needs to be diverted to combined sewer overflows (CSOs). In some cases they may be discharged without restriction or, pertinent to this case, without extracting small pieces of debris such as a cotton bud.

Figure 7. Multiple sea- and land-based sources pathways



It is recognised that:

- Two distinct actions contribute to marine litter originating from SUP, namely the purchase of plastic items, and the actual littering. Changing these two actions will require different policy responses, such as market interventions for the former and behavioural interventions for the latter.
- The amount of marine litter is proportional to the amount of plastics produced, placed on the market and purchased, all things equal.
- Often buying plastics is not a deliberate decision by consumers. The purchase is determined by the easy availability and low cost of plastics and by the absence of alternatives. Some SUP are provided to consumers free. Therefore, a combination of a trend towards (on-the-go) convenience, lack of incentives to collect items after use, limited collection infrastructure (e.g. bins) and uncivil consumer behaviour contributes to littering.

Streams and rivers are a common pathway of land-based litter into the ocean. The available data are very approximate (estimates for riverine litter in Europe range from 500 to 20 000 tonnes annually[57] to 9,300 tonnes[58] and 10,500 tonnes[59]). Currently, Member States are not

[57] http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/MSFD%20Measures%20to%20Combat%20Marine%20Litter.pdf

[58] Laurent C. M. Lebreton, J. v.-W. (2017, June 7). River plastic emissions to the world's oceans. *Nature Communications, 8*.

[59] Christian Schmidt, T. K. (2017, October 11). Export of Plastic Debris by Rivers into the Sea. Environmental Science and Technology, 51(21), 12246–12253.

obliged to take measures against litter in surface waters. In any case, it is technically not possible to install a fine enough mesh screen to stop a cotton bud stick, without affecting economic activities and ecosystems at the same time.

2.2.2. Underlying drivers of the problem

The underlying drivers are complex, with several factors leading to the current situation:

- *Wide availability of plastic as a cheap and convenient option*: the purchase of plastics is often easy and convenient, with only few and/or less convenient alternative options available. In the case of fishing and aquaculture, plastic materials have been essential in reducing production costs, improving product quality and hygiene as well as producers' health and security.
- *Consumer trend for convenience:* We live in a throwaway society, where convenience is valued highly and an on the go trend favours convenient single use plastics. The result is increased consumption of short-lived or disposable items rather than reusable alternatives, even where they exist and are environmentally preferable.
- *Market fragmentation:* Member States are taking individual initiatives, notably to limit the access to the market of some problematic products, which will lead to a fragmentation of the European market (see the chapter on the "Current policy framework").
- *Market failure*: The externalities of litter in the environment are not internalised into the costs of single use plastic items. This is one of the reasons why there is limited economic incentive to develop or choose items with a better environmental footprint. The cost of collection and transport of end-of-life fishing nets can be reduced or spread out more evenly if organised with the involvement of materials producers, as well as on a regional or national basis. At present that cost is mostly left to the ports, of which there are hundreds in the EU – this is particularly relevant in a sector where both ports, and the operators in the sector are often small-scale, with some ports' activities either overly dependent on or even exclusively limited to fishing. In short, under current and currently proposed legislation the cost is borne by ports and shippers/fishers, not by the producing sector.
- *Lack of market incentives* for the effective participation in separate collection (such as 'pay as you throw' schemes) or for the return of (beverage) containers in the form of deposit return schemes. These schemes lead to less marine litter by encouraging better waste management, are currently limited to a minority of EU countries. It also relates to complex products or packaging formats not designed for recyclability. Despite the removal of financial penalties for fishermen to bring gear ashore under the proposed revision of the Port Reception Facilities Directive, the effects of paying even indirect fees may not be sufficient as an incentive to completely exclude disposing of damaged gear at sea if storage space on board is at a premium. In addition, as the negotiations in the context of the recent proposal for the PRF Directive demonstrate, there is a significant risk that the obligation to set-up additional port reception facilities, in smaller or fisheries dependent fishing ports in particular, will lead to an increase of overall port fees.
- *Poor waste management infrastructure:* e.g. insufficient number of bins, or infrequent emptying (especially in tourism hotspots during high season), or, improper treatment of waste which then ends up as marine litter (for example, plastics released through storm overflow basins). Despite the potential value of some of the fishing gear, recycling is very limited and left to a few innovative operators. There is currently at EU level, no structured approach to setting up specific mechanisms or tackling the costs of dealing with fishing gear containing plastic once landed in port.

- *Consumer behaviour:* Consumer behaviour contributes to marine litter through the purchase of plastics (especially SUP), and the act of littering. For some plastic products, citizens have little knowledge whether they will end up as marine litter or whether they are made of plastic that will not bio-degrade in the environment. For example, most people who throw away a cigarette stub do not know that the filter is made of plastic (rather than paper), and people flushing a cotton bud down a toilet probably assume it will either degrade or be captured in the wastewater treatment. Fishers may be not fully aware of the long lifetime and lasting impact of gear lost at sea.
- *Potential harm of marine litter and associated slow disintegration of plastics:* Plastics is harmful for the environment, as discussed in Annex 3 (Sections 2.13 and 2.14 in particular). Biodegradation in the marine environment is particularly challenging. For the time being, there is no recognised method to test biodegradation of plastic in the extremely varied conditions of the coastal and marine environment.
- *Abandoned or discarded fishing gear:* Even though full implementation of existing rules such as MARPOL or the EU Control Regulation would imply that fishing gear should not be abandoned or discarded intentionally, there is evidence that this is happening at a significant scale, including because of lack of incentives to handle gear waste differently. This is mostly an issue of cost, of the burden of bringing broken gear back, and of retrieving lost gear. Given the near-impossibility of controlling whether gear is discarded or abandoned, improving on this issue is considered to be mostly a question of enhancing compliance through incentives and/or facilitation.
- *Accidental loss of fishing gear:* Gear conflict, adverse weather, vandalism and theft may result in loss of gear. Gear conflict is the contact of passing vessels with active or even passive gear. Re-locating gear at sea can be difficult because of damage by marine organisms, gear becoming snagged, removal of marker buoys and entanglement. Even though loss of fishing gear in good shape is a significant financial loss, which fishermen try to avoid, retrieving accidentally lost gear, whilst required by the EU Fisheries Control Regulation[60], may be perceived as too time and cost intensive.
- *Lack of standardised monitoring, retrieval and locating systems*. Fishermen from different flag states fish in the same waters. Information exchange and cooperation of authorities to effectively target and retrieve their lost gear is lacking. The European Maritime and Fisheries Fund promotes and supports the retrieval of lost gear, but not all countries take up this option in their operational programmes.
- *Fishing gear is expensive to recycle:* Fishing gear is often built-up material that needs to be dismantled before entering waste management or recycling. Resources are not made available for the dismantling, cleaning, and sorting needed before recycling. The few existing recycling facilities in, for example, Denmark, Lithuania and Slovenia, are running below capacity. The Icelandic and Norwegian experience with EPR-type and take-back schemes show that dedicated schemes can lead to fairly high recycling rates to the benefit of the economy in general and the fishing industry[61] in particular.

[60] Council Regulation (EC) No 1224/2009 of 20 November 2009
[61] Sverinsson (2017). Marine litter. The Icelandic approach to take back of fishing nets

2.2.3. Linking pathways and drivers to the top 10 SUP

A central issue is the understanding of the pathways and drivers for each of the ten SUP items. While it is not always easy to estimate exactly the pathway of each item of marine litter, we have a relative good general view.

- For items like cotton bud sticks, wet wipes and sanitary napkins, improper flushing is the main problem. Items that are improperly flushed could benefit from a targeted information campaign or a better information display on the product to explain consumers that these items should not be flushed and that if they are, they cause considerable harm to marine life.
- For items such as food containers, drink bottles, cutlery/straws, food containers and drink cups, poor waste management is the main pathway. A main driver is the on-the-go consumption of food product and the demand for more convenience.
- Cigarette butts are mostly littered due to uncivil behaviour. There are consumers, who might reduce their littering, if they know that butts are made of plastic.
- Balloons and balloon sticks are let floating in the open air, and land in nature.

Table 5. Drivers and Pathways for SUP items

Item	Underlying drivers						Pathways		
	Availability of plastic as cheap convenient option	Consumer trend for convenience	Market failure	Low levels of collection and recycling	Poor infrastructure	Consumer behaviour	Disposal in toilet and insufficient waste water treatment and sewage management	Littering	Poor waste management
Drinks bottles	++	++	++	++	+	+		++	++
Cigarette butts	++			+	+	++	+	++	
Cotton bud sticks		+		+	++	++	++		+
Crisps packets	++	++		+		++		++	
Sanitary applications	+			+	+	+	++	+	
Plastic Bags	+	++	+	+		++		++	+
Cutlery, straws & stirrers		++		+	+	++		++	++
Drinks cups & lids	+	++	+	+	+	++		++	+
Balloons & sticks	++			+		++		+	+
Food containers	+	++	+	+	+	++		+	++

Note: if there is a non-plastic alternative, then availability of plastic as cheap convenient option will be ranked low; market failure is scored highly if markets could play more of a part by reflecting the environmental damage; low levels of recycling is scored highly if recycling could play more of a part; poor infrastructure relates to whether if properly disposed of, it still finds its way on to beaches.
Source: based on JRC Technical Reports.

2.3. Who is affected, in what ways, and to what extent?

EU citizens: Citizens are affected by marine litter, in terms of unsustainable resource consumption and the pollution of marine environments that lead to death of marine life, loss of fish stocks, degradation of landscapes, contamination of the food chain and public health impacts. EU citizens also bear the costs of collection, treatment and cleaning up of waste. The public consultation, that received more than 1800 contributions, shows that marine litter is a significant concern. Recent Eurobarometer surveys found that 74% of European citizens are concerned about the impact on their health (74%) and on the environment (87%) of everyday products made of plastics.

Non-EU citizens: Marine litter from Europe or European producers affects citizens in countries outside the EU due to the cross-border nature of pollution and marine littering.

Fishing industry: The pollution of the sea affects the marine ecosystem and results in losses in fishing stocks, for example due to 'ghost fishing', which translates into a loss of 'raw material' for the fishing industry as well as loss of fishing time and extra costs due to damaged equipment and security and navigation hazards. Accumulation of plastics in the food chain could become detrimental to the image of the products of the seas. The lack of dedicated mechanisms across the EU to manage fishing gear waste mean that disposing of waste gear is seen as a burden for fishers rather than part of the normal lifecycle of a product, the burden of which is shared across all relevant parts of the value chain, from producer to end-user. The PRF Directive goes some way in tackling the problem, but on balance is likely, without additional measures, to lead to extra cost for fishers at least in some cases.

Public authorities are affected by the increased costs and administrative burden associated with littering (cleaning operations on roads, beaches, in cities, in the neighbourhood of fast food restaurants, etc.) as well as enforcement of prevention measures and treatment costs.

Tourism industry and local businesses: Littering incurs an aesthetic cost to society, which can affect local businesses, especially the coastal tourism industry as it makes beaches and marine environments less attractive recreational destinations. This may have dramatic consequences for territories basing their development on tourism, such as many EU islands.

Brands: As the issue of marine litter is of a significant concern for people, brands suffer from reputational damage when their products (including packaging) are found on beaches and in the aquatic environment. NGOs target specific brands through marine litter campaigns.

Plastics industry: The plastics industry image is damaged by marine litter, and the public opinion on plastics in general is becoming negative, which could affect (or at least dampen the increase in) demand for SUP and plastic products in general, exemplified by " no-plastic" campaigns, which reach a growing number of citizens. In absence of effective solutions, countries inside or outside the European Union are increasingly considering or even applying radical approaches often detrimental to the plastic industry.

Plastics recyclers: Marine litter represents a loss of valuable resources. These specific plastic items could have turned into secondary raw materials. It therefore affects the European plastic value chain, in particular recyclers due to the non- resource efficient approach for these specific plastic items. This is particularly noticeable in the fishing gear context, where

appropriate mechanisms to organise treatment and recycle or reuse of gear material are not frequent, which contributes to low recycling rates of what is often very high quality material.

2.4. Current policy framework

Marine litter has long been recognised as a problem. Over the years, a number of measures and obligations relating to marine litter have been integrated into the policy framework related to water and marine policy, to waste and product policy as well as to Common Fisheries. These policies target different pathways but are fragmented in terms of focus and ambition. They do not *specifically* target the ten most littered items and mostly contain only general measures. Consequently, they have not had the necessary impact on preventing or reducing marine litter. The recently adopted Plastics Strategy highlights the gaps in the current legal and policy framework to tackle marine litter. Annex 5 sets this out in more detail.

The Marine Strategy Framework Directive (MSFD) requires Member States to reach Good Environmental Status (GES) by 2020. Marine litter is one of the eleven descriptors for which, wherever feasible, 'threshold values' are developed. Member States have to provide Programmes of Measures to make sure that GES will be met on time. These programmes are broad as they tackle all pressures on marine waters. A first ongoing assessment shows that they provide a useful overview of the actions undertaken or planned, but that additional, more concrete actions are needed to reach Good Environmental Status. Given the propensity of litter, like other contaminants, to be carried by wind, currents and tide, the problem is transboundary in nature and co-operation between countries is necessary. Given that this does not happen on its own, EU action and support is needed to ensure a coherent and comprehensive approach.

Other legislation tackles specific pathways, such as the urban wastewater treatment directive (UWWTD) which is currently being evaluated and is relevant because some items (e.g. improperly flushed) might be captured or not depending on the organisation of the wastewater collection system and the level of treatment applied. One of the limitations of this Directive relates to the requirements on capture and treatment of the storm waters overflows, which would need to be re-considered.

Waste legislation has a role in ensuring waste is collected and treated. Ambitious recycling targets for municipal waste (65% by 2030) and plastic packaging waste (55% by 2030) will increase capture of plastic waste. However, whilst Member States will need to improve their collection systems to achieve those targets they can reach them without in depth efforts to prevent littering. Moreover, the provisions in the revised Packaging Directive on waste prevention are more general in nature, e.g. an obligation to "encourage" reuse of packaging. Fully applying and enforcing waste legislation will therefore not solve the problem, as there will still be littering and leakage of plastics into the environment. A more detailed assessment of the gaps in the existing legal framework can be found in Section 5.2.1.

So far, the only product-focussed legal instrument specifically tackling a SUP item, the Plastic Bags Directive, has been a success in reducing consumption of lightweight plastic carrier bags, while reducing related environmental impacts and stimulating reuse. Building on the success of this directive a similar, targeted, approach is now adopted for a wide range of other, specific single-use plastic products, which, like plastic bags, constitute the most littered items in the Union beaches. The measures identified in the Plastic Bags Directive (a

consumption reduction target and economic instruments) are part of the preferred option of this initiative. The preferred option goes beyond these measures for some products, where good substitutes exist, by fully restricting their market access.

All of the Top 10 SUP items share with plastic bags the characteristic that if not littered (generally on land with a proportion then being transported into the seas) or improperly disposed of through sewers (such as flushed down the toilet), they would not end up as marine litter. Anti-littering policies are well established, as is an anti-littering culture, but the evidence suggests that littering will continue and that there are limits to enforcement of anti-littering / improper flushing policies including behavioural policies to shift cultures.

As part of the Circular Economy Action Plan, an aspirational target to reduce marine litter by 30% was adopted by the Commission in 2015. This objective was subsequently endorsed by the Council, but it was not linked to specific measures and obligations.

Waste from fishing gear is regulated through a range of EU instruments; most of them are currently under revision in the legislative process. They tackle some of the problem drivers for abandoned and lost fishing gear but leave gaps in several respects. The following instruments apply:

- Proposed revision of the Port Reception Facilities Directive[62]. This sets out a number of measures to tackle marine littering caused by fishing gear:
    - Introducing a 100% indirect fee for garbage from ships, including derelict fishing gear, as well as passively fished waste, thereby reducing disincentives stemming from port fees to bring back fished up waste ashore. However, if the total amount of waste brought ashore increases, the charge to all fishing vessels will also increase, particularly in small fishing ports with few or no existing facilities. No compensation for potential increases in port fees due to the need to set up new or significantly extended port reception facilities is envisaged.
    - Requiring Member States to improve port reception facilities for waste from ships. However, the proposed Directive does not envisage setting-up separate fishing gear collection and treatment streams for recovery of valuable material used in fishing gear for recycling.
    - Finally, in the Commission's proposal it was underlined that "*additional measures for reducing lost or abandoned fishing gear are examined, such as extended producer responsibility and deposit-refund schemes for commonly littered fishing gear*"[63].

- The planned review of the Fisheries Control Regulation[64]:
    - Requires to mark gear (Article 8)[65], to carry retrieval equipment on board, to retrieve lost gear or to report its loss in case it cannot be retrieved (Article 48).

[62] COM(2018)33 final
[63] Explanatory memorandum, section 1
[64] REGULATION (EU) No 508/2014
[65] Detailed requirements are included in the Control Implementing Regulation

The planned revision will introduce daily electronic reporting for all vessels and remove the exemption of small vessels from the obligation to carry retrieval equipment; it does not deal with the port side aspects of returning gear, nor provide any incentives to improve on the rate of abandonment of gear itself.

- European Maritime and Fisheries Fund (EMFF)[66]
    - 2014-2020: 108 operations to support the removal of litter from the sea are included in authorities' operational programmes. Infrastructure improvements at ports and community led local development projects can also lead to more appropriate trreatment of marine litter although it is not possible to determine the level of funding envisaged. Post 2020: It is envisaged, in line with the Commission's Plastics Strategy, to make marine litter a funding priority under the new programming period, which could include support for the costs schemes to manage treat and recycle fishing gear material.

At the international level, the FAO voluntary Guidelines on the Marking of Fishing Gear adopted in February 2018 are expected to be endorsed in July 2018 and then implemented.

The recently adopted Plastics Strategy highlights the gaps in the current legal and policy framework to tackle marine litter and proposes targeted measures to improve the prevention, collection and recyclability of plastics, in particular, of plastic packaging. It also aims to develop a regulatory framework for plastics with biodegradable properties to prevent harm to ecosystems. It highlights the perspective of additional measures specifically on fishing gear. The European Chemicals Agency is preparing restriction dossiers for microplastic particles intentionally added to preparations, such as cosmetics, and the use of oxo-degradable plastics. Besides, the problem of micro-plastics for marine litter, the Strategy identifies single-use plastics as a specific problem for the marine environment.

Overall, there is a wide range of polices and instruments touching upon the issue of marine litter and plastics – reflecting the wide range of sources, means of release and pathways of marine litter. However, there is a gap between the problems identified, their drivers and the availability of legislative tools and measures that can effectively target the sources of marine litter. Existing legislation in its current form, even if fully implemented and enforced will not significantly reduce the harm caused by marine litter, and in particular does not target the most commonly found SUP items adequately. It also leaves a gap regarding the specific requirements related to fishing gear which could benefit from dedicated and well financed mechanisms supporting the needed specific waste and recycling streams.

In conclusion, the existing waste acquis is not sufficiently focused and detailed to deal with the issue of marine litter in a systemic way, prioritising prevention both in terms of items covered (currently only plastic bags are specifically targeted by qualitative and quantitative objectives) and the measures across the value chain (i.e. upstream measures implementing the polluter-pays principle through product design, extended producer responsibility and information tools versus downstream waste management). To cover the full range of most relevant single-use items and deal with them in a targeted way (including the upstream design

[66] REGULATION (EU) No 508/2014

part), specific EU level legislation is needed to focus the requirements of waste prevention, based on an item-by-item analysis and, where appropriate, addressing market access or consumption reduction, design features, labelling or specific EPR measures.

2.5. How will the problem evolve?

There is a baseline scenario in the form of Option 1, to quantify how the situation in relation to marine litter may develop if the EU decided to limit itself to implementing policies and instruments currently available. In this section, the focus is on the likely development of the underlying drivers.

- *Wide availability of plastic as a cheap and convenient option for single use applications:* Production of plastics and plastic packaging is forecasted to grow, and so are most of the SUP categories.
- *Consumer trend for convenience:* There is no evidence that the growth in the use of short-lived or disposable items at the expense of reusable alternatives will halt or even slowdown. On the contrary, demand for such items continues to grow.
- *Market fragmentation:* Other Member States will follow the recent examples of France, Italy and UK. Ireland and Portugal for instance are examining the use of economic instruments. When these limit the access to the market of some of the problematic products, it will lead to a fragmentation of the European market.
- *Market failure:* market incentives will increase with the use of Extended Producer Responsibility to reduce the percentage of plastic bottles not collected and recycled. Further financial incentives to reduce consumption of lightweight plastic bags may be put in place. However, those incentives will not capture the full externalities. Regarding fishing gear, requirements on separation of waste material streams on boards and at ports will improve adherence to the waste hierarchy but will not directly address the issues around end destination and incentivisation of compliance. They will also not address the specific costs of returning fishing gear waste, particularly for small ports and fishing operators. Nor will they promote the development of currently infrequent but needed specific waste management and recycling/re-use cycles supported by materials manufacturers.
- *Lack of public awareness and lack of market incentives*: the policies in place and in the pipeline should increase awareness of the impact of litter, but probably with limited results. E-reporting under the Fisheries Control Regulation may improve compliance with reporting requirements for lost gear, but not reduce the losses themselves. The revised Port Reception Facilities Directive removes a disincentive by stipulating that the fee for landed waste should not depend on the amount of waste delivered, but does not add specific incentives for fishers to land gear waste.
- *Poor waste management infrastructure:* infrastructure will improve over time to capture more recyclable waste avoiding landfill and incineration, but will not directly target marine littering. The lack of adequate and sufficient infrastructure for the collection of waste fishing gear will be mitigated through the revised Port Reception Facilities directive, but this is unlikely to eliminate all disincentives related to transporting cumbersome and heavy gear material onward from the ports. Recycling benefits from economies of scale. It works on a national scale as in Iceland but is not worthwhile for individual ports as happens at present. The measures related to port reception facilities will not impact similar issues related to inland waters, or aquaculture facilities not linked to commercial ports.

- *Consumer behaviour:* paradoxically, while there is considerable public pressure for marine litter to be tackled, there is relatively little sign of people's behaviour changing with regard to the purchase, use and inappropriate disposal of plastics.
- *Potential harm of marine litter and associated slow disintegration of plastics:* Plastics will remain harmful for the environment. While research and innovation are ongoing to make some plastics biodegradable in the marine, standard to verify just claims still need to be developed. Further, it is important to keep in mind that upstream measures, such as prevention, are often more effective and one should not to give the message to consumers that items can be littered.
- *Abandonment or discarding of gear:* If the legislative measures already proposed are adopted, unaltered, the current situation will improve to some extent with a reduction of the disincentive related to returning waste to port (in accordance with the PRF Directive) and, if they are monitored and enforced, with the strengthening of the obligations under the Fisheries Control Regulation. However, their impact will be limited if not complemented with action to reduce unnecessary costs for the sector.
- *Accidental loss of gear*: The main causes for loss of gear: Gear conflict, adverse weather, vandalism and theft that result in loss of gear will not disappear.
- *Lack of standardized monitoring, retrieval and locating systems.* Although the reporting obligations under control regulation have been strengthened, and vessels <12 m are now also required to carry retrieval equipment on board, no mechanism has been envisaged for monitoring gear abandonment or loss on the sea-basin scale that is necessary for retrieval.
- *Fishing gear expensive to recycle*: No changes are envisaged.

3. OBJECTIVES: WHAT IS TO BE ACHIEVED?

The **general objective** is to curb the negative economic, environmental and social impacts arising from plastic marine litter. More **specifically**, to:

- Limit plastic marine litter (found on the beach, the seabed and floating on the sea surface), and – if still littered – limit the negative economic, environmental and social impacts from (a) Single Use Plastics (SUP) placed on the market in Europe and (b) abandoned, lost and otherwise discarded fishing gear (ALDFG) from the European fishing sector;
- Tackle a common and transboundary problem in a coordinated and coherent way across the EU, enabling effective action at scale while complementing national measures;
- Ensure a continued proper functioning of the internal market by avoiding fragmentation of measures across Member States;
- Avoid disadvantages for small ports and fishing operators who might be disproportionately affected by the development of new PRFs and could benefit from additional measures supporting the development of specific waste and recycling streams for fishing gear, and from burden sharing mechanisms such as EPR that involve producers of gear materials in the management of the problem;
- Ensure a shared direction and framework to guide future actions and to support strategic innovation into materials, products, technologies and business models within the EU (i.e. "future-proofing").

4. WHY SHOULD THE EU ACT?

4.1. Legal Base

EU competence stems from the articles of the Treaty on the Functioning of the European Union (TFEU) related to the protection of the environment (Article 192 (1) TFEU) and the internal market (Article 114 TFEU). The measures identified in the preferred option pursue the objectives: to prevent and reduce the environmental impacts; to define market restrictions and product requirements ensuring a proper functioning of the internal market with high environmental standards and avoiding fragmentation by national approaches.

Measures to reduce marine litter are already included in EU legislation through the Waste Framework Directive, the Marine Strategy Framework Directive, the Packaging and Packaging Waste Directive and the Fisheries Control Regulation under the EU Fisheries common policy and these acts are mainly based on environmental legal basis in Article 192 TFEU.

The CFP manages EU fisheries as a common policy. It should contribute to the protection of the marine environment, to the sustainable management of all commercially exploited species, and in particular to the achievement of good environmental status by 2020, as set out in Article 1(1) of Directive 2008/56/EC of the European Parliament and of the Council.

With respect to the environmental dimension, the EU's right to act stems from the fact that marine litter represents both a common *and* a transboundary challenge, with marine litter travelling considerable distances.

4.2. Necessity of EU action and EU added value

Marine litter is a transboundary issue. European policy would have a direct impact on marine litter in European seas, and beyond. Litter that starts in Europe can travel long distances and is found, for example, in the Arctic. Hence, European policy would tackle the European contribution to both the problem of marine litter in the EU and outside the EU. In addition, action at the European level legitimises the EU position as a global leader in ocean governance and may catalyse action in other countries and regions as in other international areas such as e.g. climate policy.

The public consultation indicated overwhelming support for action to tackle single use plastic marine litter, with 98.5% of respondents considering such action “necessary”, and 95% “necessary and urgent”. More than 70% of manufacturers and more than 80% of brands and recyclers considered action necessary and urgent.

While marine litter is a transboundary issue, current action by Member States is fragmented in terms of scope, focus as well as ambition. Most measures against marine litter are adopted in the framework of MSFD. In that context, the first measures reported by Member States in order to reach GES by 2030 address a variety of sources and types of marine litter, but they do not consistently address all major sources of marine litter and they are not coordinated among the neighbouring countries and within a marine region. These measures taken by Member States are of different level of intensity and intervention from product to product and from country to country.

The actions taken at Member State level have had some effect, but do not tackle the problem in a comprehensive and coordinated way. Current experiences in a good number of EU Member States indicate that without a more targeted EU-wide initiative on marine litter specifically focussing on the most littered items, EU wide impact is unlikely. Also, without such an initiative, EU-wide markets for alternative solutions with sufficient economies of scale will not develop. New national actions targeting a diverse list of products (such as Italy's ban on plastic cotton buds and French rules defining national biodegradability criteria for the marketing of plastic SUPs) cannot by themselves solve the problem.

There is a risk that further efforts at the national level will result in a scattered approach with each Member State taking action separately targeting different products in different ways. For some items (e.g. caps and lids), the problem of littering can be tackled through product design changes. In such cases there is a clear link to 'product policy' and market access in the internal market where a level playing field for businesses is important.

A more detailed analysis is contained in table 6 below as well as in Annex 3. The fragmentation of policies, measures and level of ambition in this area would lead to variable restrictions of market access (with a potential to favour national industries), barriers to the free circulation of goods and unfair competition, possibly linked to protective measures, between producers in different countries.

Many of these measures have not yet entered into force or had time to have full effect on the functioning of the internal market. As science and the public opinion are advancing, other Member States are planning to take action. This will add to the layer of complexity and variable geometry hence increasing the risk of creating uneven playing field for the economic operators.

It is a problem for the internal market even if, for example, cutlery is subject to marketing restrictions in one country but not in another. This is problematic because of the increasing complexity of supply chains, harmonised production for the whole or large parts of the European market, and the incredible complexity that could arise with 28 countries adopting different legal and policy approaches to diverse and different products (with inevitably multiple cases of bordering countries having different approaches). The degree of the fragmentation of national or even regional and local approaches will depend on these factors and the extent of variation among neighbouring countries in particular.

Table 6. Examples of existing measures regarding SUPs across EU Member states

Member State/ Country/Region	Measure	Item Addressed / Detail	Year
Belgium – Brussels Region	Ban	Ban of ultra-lightweight plastic bags	Sept. 2018
Denmark, Island of Samsø	Ban	All plastic bags	2018
France	Ban	Plastic cups, glasses, plates and cutlery. Includes plastic coffee cups (exception for home compostable ones and/or partly or fully made of bio-based plastics)	2020
France	Ban	Plastic cotton buds	2020
France	Ban	Ultra-lightweight plastic bags "produce bags" e.g. those used to pack fruit and vegetables, meat and fish. Compostable bags are exempt	2017
France	Ban	Oxo-fragmentable bags	2015

Member State/ Country/Region	Measure	Item Addressed / Detail	Year
Italy	Ban	Non-Biodegradable plastic cotton buds	2019
Italy	Ban	Ban on ultra-lightweight bags e.g. used to pack fruit, vegetables, meat and fish. Compostable (CEN 13432:2002) and bio-based (UNI CEN/TS 16640) bags of less than 50 microns are exempt	From 2016
Italy	Ban	Throwing cigarette buds into the environment	2016
Portugal	Ban / restriction	Budget law established a working group to propose actions to limit SUP in the framework of green taxation	Proposal by May 2018
Scotland	Ban	Plastic Cotton Buds – Proposal to introduce a ban will be put to public consultation	2018 (proposed)
Scotland	Ban	Investigating the potential for banning plastic straws	Proposed ban
Scotland	Ban	Single Use Plastics – Ensure plastic is reusable / recyclable by 2030	2030
Spain – Balearic Islands	Ban – Regional	All single use consumer plastics – items will have to become “easily recyclable” or switch to biodegradable alternatives	2020
Spain – Balearic Islands	Law – Regional	Wet wipes will be required to be clearly labelled as to prevent flushing	2020
Spain – Balearic Islands	Law - Regional	Law will address plastic bottles by requiring restaurants to provide tap water free of charge.	In discussion

Source: Eunomia (2018)

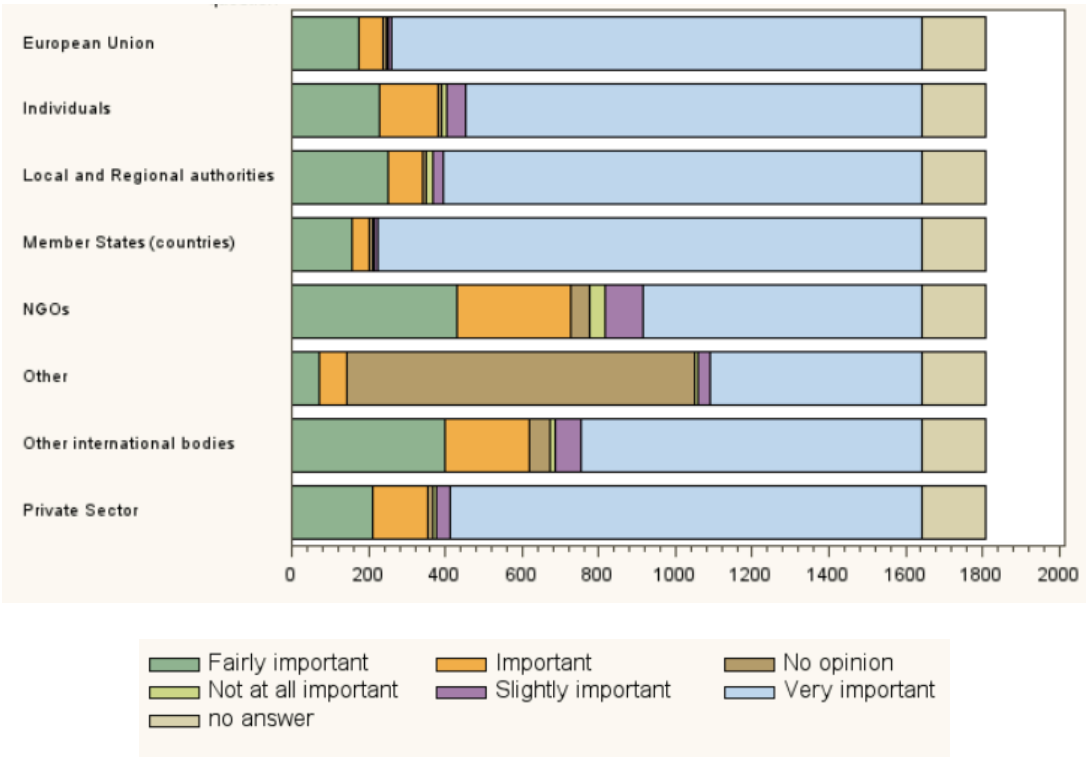
The public consultation, which is also relevant for national policy makers, has shown that action is considered desirable at all levels (Member States, the EU, local and regional authorities and the private sector, in that order, followed by individual responsibility).

The public consultation revealed strong support for action at EU level: 59% regarded an approach based on new EU measures as “very effective”; 54% regarded better enforcement of existing measures would be “very effective”.

Only 2% of respondents believed that there should be no new measures at European level and 79% believed that not taking EU measures would mean ineffective measures. Also notable is that of those calling for European level action 36% specified this should be focused on maintaining a level playing field in respect of single market and competition rules.

A number of EU-level instruments deal with fishing gear. Complementing these instruments would be done most effectively by EU-level action ensuring a continued uniform approach. By way of example, the programmes of measures under the MSFD targeting fishing gear are being designed by Member States on an individual basis, where some of the proposed actions (e.g. EPR, recycling) would be better done on a common footing. A number of actions to tackle sea-based sources of marine litter are already taken at EU level (e.g. the Port Reception Facilities directive). The Common Fisheries Policy, whose objective is the conservation and management of marine biological resources, is implemented through EU legal instruments such as the Control Regulation. Any action to complement the existing legal framework at an EU level would maximise its added value. Conversely, action to complement the existing framework but taken at national or regional level would risk undermining the existing framework by distorting the “level playing field”.

Figure 8. Public consultation – views on importance



In some cases[67], there are regional or national measures which aim to incentivise in particular fishers to bring back fished up waste and gear to shore by for example waiving port fees or waste fees. This can impact the competitiveness of fishing operations on the one hand, by providing an advantage to local fishers over their neighbours or jeopardise an otherwise positive measure by making it unsustainable because it would attract waste from non-local operators, resulting in disproportionate costs for the local ports or regional organisations. EU action in support of such mechanisms across the EU would level the playing field whilst improving the overall collection rate of fishing gear waste.

Similarly, the advantages of an indirect port fee system excluding separate charges for waste collection can be reduced in cases where the implementation of enhanced port reception facilities leads to a de facto increase in port costs, particularly in small ports and for small operators, notably in the fishing sector. Complementing the measures envisaged in the revised PRF Directive with action that minimises or eliminates the additional cost for ports and small scale operators as a result of envisaging extended producer responsibility for fishing gear containing plastic would strengthen the overall impact of EU level measures to reduce marine litter.

The added value of EU action would lie in providing a framework for more specific coordinated action that is effective and efficient in achieving the common goal to prevent and reduce the impact of marine litter in the EU. Action at EU level would:

[67] Denmark is one example, KIMO (North Sea) another

- avoid disruption in the free movement of goods in the Union market, which results from scattered measures at national level targeting different products or same products, but with different measures, as for example different product bans country by country
- provide a clear and strong signal to the product markets because EU action would increase the scale and viability of the proposed actions and that would help to create a wider market for the alternative products or business models and consequent positive impacts in, growth and jobs;
- reduce implementation costs for economic actors, in particular, by providing a harmonised, EU-wide framework for measures such as marketing bans and requirements and consumption reduction targets and by facilitating cross-border partnerships to save costs – for instance to deal with waste fishing gear;
- address the transboundary nature of marine litter and ensure a level playing field among the Member States and their economic operators' efforts in tackling marine litter;
- complement and reinforce existing EU legislation to effectively tackle the different drivers and pathways of marine litter in a more specific and targeted manner;
- facilitate the sharing of positive experiences and best practices.

Some measures (such as product bans, design requirements etc.) would be best established at EU level, whilst for other measures (such as reduction targets for products without sufficiently available substitutes or information campaigns) Member States should have freedom to choose among specific implementation methods, in line with the subsidiarity principle. This follows the approach of the Plastic Bags Directive (EU) 2015/720 that sets a clear common direction at EU level, but gives Member States some choice on the measures, including the use of economic instruments. The Directive has led to drastic cuts in lightweight plastic bags to the approval of citizens across Europe.

4.3. Consistency of these objectives with other EU policies

Given its focus on more efficient resource use and a more effective and circular plastics economy/value chain with better economic and environmental performances, the initiative is fully in line with the objectives of the Circular Economy policy. The Circular Economy is an integral part of the 10 priorities of the President, in particular the one on jobs, growth and investment.

The initiative aims at preserving the internal market from fragmentation, which is – by essence – one of the key objectives of the Union.

The initiative is fully consistent with the overall objectives of EU waste policy and the EU waste hierarchy according to which waste prevention should be given the highest priority. The initiative serves the objectives of the EU's Packaging and Packaging Waste Directive – environmental protection and preservation of the internal market. The initiative is also in line with the provisions of the soon to be amended Waste Framework Directive notably on the prevention objective to halt the generation of marine litter and to the requirement to take measures to combat all types of litter. While in line with all the waste acquis, the initiative goes one step further and addresses the gap in the current legislation which lacks specific provisions for the most harmful items from a marine littering perspective (besides microplastic for which separate action is already foreseen in the Plastics Strategy).

The initiative complements the measures against marine litter, undertaken by the Member States under the Marine Strategy Framework Directive (MSFD) and will support its effective implementation.

The stakeholder consultation on the initiative yielded strong support for additional action to incentivise the return of gear to shore and ensure compliance, and which supports the proposed initiative. In the response of the stakeholders to the question about the **selection of measures to help reduce lost and discarded fishing gear** with the most selected options:

1. Incentive to bring fished up litter and end-of-life gear ashore (88%)
2. Better collection and sorting facilities on vessels and at ports (70%)
3. Incentives/Funding of retrieval action (68%), and
4. Better enforcement of existing rules (67%)

Similarly, the public stakeholder consultation asked which additional targeted m**easures would support the bringing fishing gear back ashore**. Respondents favoured with 59% deposit return schemes levied on fishers and with 53% an extended producer responsibility scheme including a levy on gear.

The initiative complements existing measure at EU level that aim at tackling the problems related to ALDFG, by proposing measures that: provide additional incentives for the users of fishing gear to return gear waste to shore, enhancing compliance with the existing framework of rules; allowing for the development of schemes for the proper inclusion of fishing gear waste in waste management and recycling streams.

In doing so, the initiative will complement and reinforce the legal framework proposed by the Commission for the reception and management of waste from ships in ports (COM(2018)33 *legislative proposal for a new Directive on port reception facilities for the delivery of waste from ships*). This framework also includes requirements for providing cost recovery systems for this type of waste based on a 100% indirect fee for garbage (MARPOL Annex V).

Action under the objectives of the Common Fisheries Policy (CFP), including the requirement to implement an ecosystem approach to fisheries management that ensures that negative impacts on the marine ecosystems are minimised. It takes advantage of provisions under the EU's Common Fisheries Policy (CFP), in particular those of the Fisheries Control Regulation addressing ALDFG, and of the EMFF Regulation encouraging the involvement of fishermen in the reduction of marine litter. It complements the Technical and IUU Regulation where they do not provide provisions specifically targeting ALDFG.

Internationally, this initiative is consistent with the Communication on International Ocean Governance and the commitments taken in Malta at the Our Ocean Conference. This initiative is coherent with the 2017 Strategy "Towards the Outermost Regions". Finally, the initiative is consistent with the EU's international obligations in the area of trade policy, notably by ensuring equality of treatment for products produced in the EU and imported products.

5. POLICY OPTIONS

5.1. Options and products for detailed analysis

5.1.1. Options not analysed in detail

Recommendation: This would essentially reconfirm the current situation of an indicative non-binding target, as expressed in the 2015 Circular Economy Action Plan. A Recommendation by itself would therefore not bring any added value.

Sanctioning the loss and abandonment of fishing gear by reducing fishing quotas. This option would likely be counterproductive and almost impossible to control without disproportionate administrative and financial effort.

Voluntary recycling schemes by fisheries associations. Fishers take back to port end-of-life or broken gear and are compensated by recyclers for delivering clean, sorted plastics depending on the quality and type of material. Although in Iceland, such a scheme is running successfully - 70% of the retrieved gear can be recycled and 90% of it is sent for recycling to Lithuania – the variety and decentralised nature of EU fisheries precludes such a voluntary approach.

5.1.2. Prioritisation of sources of marine littering and products for further analysis

The prioritisation method aims to reflect the prevalence and environmental impact of different sources along with the existence of ongoing efforts to tackle them. Where such efforts are ongoing, there is little value-added in including them for further analysis. As such:

- **Microplastics intentionally added to a product** are excluded, as they are being assessed by ECHA through the preparation of a distinct restriction dossier under REACH. Similarly, **primary micro plastics coming from other sources** (tyres, textiles and plastic pellets) requires completely different policy answers and therefore are not covered in the analysis. These policy answers are detailed in the Plastics Strategy and will include a combination of standardisation, labelling, product requirements and actions along the whole value chain.
- **Litter emanating from sea-based sources** are partially covered by international obligations (in particular MARPOL Annex V) and at the EU level by the PRF Directive and its revision. There is scope for complementing that legislation, in particular, by targeting the specificities of fishing gear, which will be examined below. End-of-use recreational boats are an important source of sea-based litter – with only around 2,000 boats being dismantled of the 80,000 that annually reach the end of their lives and the remaining likely to be left abandoned will also not be covered here.
- **Non-plastic debris** is excluded – in many cases this does not persist, in other cases, it is mostly inert materials, and with relatively low environmental damage, (though it may be relatively visible).
- **Plastic bags:** Directive (EU) 2015/720 defines an obligation for Member States to take measures to reduce consumption of lightweight plastic carrier bags by defining a maximum consumption level (to be attained by end of 2019) and/or by requiring that such bags are provided to consumers at the point of sale free of charge (measures to be put in place by end of 2018). Member States have to report the annual consumption of lightweight plastic carrier bags as of May 2018. An overall picture of the effect of

the measures in the EU is not yet available but evidence from Member States such as Ireland that is already applying such a policy, show convincing results in the reduction of the use of plastic bags (90% reduction in just over one year) and of the presence of such bags in marine litter. New measures on plastic bags await an assessment by the European Commission on the effectiveness of current measures and on whether new measures are required for the reduction of "other plastic bags" by November 2021.

The focus is therefore on two areas that form the main sources of plastic marine litter that are either not addressed by existing legislation, or where relevant legislation does not include in its scope adequate measures:

- The Top 10 Single use Plastics (SUP), with this Top 10 making up 43% of total beach counts;
- Fishing gear (which makes up around 27% of total beach counts).

5.2. Description of the policy options

5.2.1. Option 1: "baseline scenario"

This option covers the current regulatory framework that includes measures and policies at EU level that have been recently adopted or proposed by the Commission. This option entails an increased focus in the existing legislation on items already covered today in separate collection schemes (e.g. packaging such as beverage bottles, bags) and on fishing gear. It also includes the general expected changes in consumption for single use plastics items.

The measures included in this option include:

- Measures on waste management, including those of the recently revised Waste Framework Directive and Packaging and Packaging Waste Directive (that will enter into force in 2020, when Member States will have to transpose these amendments):
  - The Packaging Directive, as amended, will re-focus the prevention objectives on re-use of packaging, however, the substantial obligation will merely require Member States to "encourage" the reuse of packaging. More ambitious and concrete measures in the Packaging Directive are envisaged only with regard to one SUP item - plastic bags. For other SUP items, due to the general nature of the prevention and reuse obligations and the flexibility for Member States to choose the measures, positive effects are much more uncertain. The review of the essential requirements for packaging for purpose to facilitate separate collection and recyclability in view of the circular economy objectives is already announced, for 2020, in the EU Plastics Strategy.
  - The Packaging Directive, as amended, will also establish higher recycling targets – 50% by 2025 and 55% by 2030 for plastic packaging[68]. This would require Member States to improve their separate collection in terms of both capture and quality of the collected material and divert that waste from landfill and incineration to recycling.

[68] Not to be confused with the reduction targets proposed in this Impact assessment for certain items.

However, the increase in recycling rates as such does not necessarily require in depth efforts to reduce littering or/ an extension or improvement of separate collection close to water bodies where the waste loads have large seasonal variations.

- The revised Packaging and Packaging Waste Directive requires all Member States to introduce extended producer responsibility (EPR) schemes for all packaging by 2025. However, non-packaging single-use plastic products are not covered by these schemes. Moreover, for plastic packaging single-use products this is unlikely to lead to reduced marine litter as in most Member States EPR schemes have already been in place for many years for household packaging, which represents half of the top 10 SUP items.
- The amendments to the Waste Framework Directive will set minimum requirements for EPR schemes. The requirements make it optional for Member States to require that EPR schemes contribute to waste prevention, including through prevention campaigns or clean-up of litter.
- The Waste Framework Directive contains new, general waste prevention objectives requiring Member States to take measures (a) aiming to halt the generation of marine litter as a contribution to UN SDG 14 to prevent and significantly reduce marine pollution of all kinds; (b) to take appropriate measures to prevent and reduce litter from products that are the main sources of littering notably in the marine environment; and (c) to organise information campaigns to raise awareness about waste prevention and littering. These measures ("that shall aim to") do not require Member States to achieve or demonstrate the attainment of the objective pursued and they leave significant flexibility with regard to the products that Member States may choose to target and the measures to do that, including through possible market restrictions. As described above this may lead to a fragmentation of the internal market.
- The Waste Framework Directive contains a requirement on Member States to revise their (a) waste prevention programmes to reflect the general objectives with respect to the prevention of (marine) litter and (b) waste management plans to provide for general measures to combat and prevent all forms of littering and to clean up all types of litter (not limited to land based litter). Member States will also be required to coordinate these plans and measures on litter with other plans and measures that they are required to adopt under international and EU water legislation to tackle litter in the aquatic environment[69]. It is not possible to calculate by how much the quantities of marine litter will be reduced exactly as a result of this obligation, in particular, because it is a more procedural requirement with no measurable outcome.

- The Marine Strategy Framework Directive (MSFD), Urban Waste Water Treatment Directive and Water Framework Directive:
  - Under the MSFD, Member States had to adopt measures to address marine litter by 2016. On the basis of the information contained in the programmes of measures submitted (in 2016) by the Member States, it is not possible to calculate by how much the quantities of marine litter will be reduced. The Commission's assessment of the measures shows that the most common type of measures reported by Member States include beach clean-ups and 'fishing for litter'. These are costly downstream measures, as opposed to upstream measures to improve waste management and prevention, and

[69] Regional Seas Conventions, Directive 2008/56/EC and Directive 2000/60/EC

that do not prevent the littering at source. Therefore, they only have a modest impact on reducing the pressure, although they do raise awareness. Targeted measures for beach litter, such as by limiting the proliferation of single-use plastics, or for the reduction of microplastics and of litter from aquaculture were largely absent in Member States' programmes of measures under the MSFD. Some Member States have taken measures to limit the use of certain plastics in view of its impact on the marine environment, but have not reported them as part of their programme of measures.

- The Urban Waste Water Treatment Directive provides minimum requirements for the infrastructure for the collection and treatment of urban waste water and quality criteria for the treatment. However, this Directive is not effective with respect to the requirements on capture and treatment of storm water overflows and concerning microplastics, which are not covered by the directive. This is in particular an issue for flushed items such as plastic cotton bud sticks and sanitary applications for which the pathway into the sea is through sewage systems. The Water Framework Directive requires Member States to adopt programmes of measures to achieve good ecological status (GES) of the water bodies but it does not specifically require action against marine litter or as criteria against which GES should be assessed. Improvements in its implementation should be expected as a result of the new requirement to coordinate these programmes with those under the MSFD and Waste Framework Directive.

- Port Reception Facilities Directive:
  - Introduces a 100% indirect fee for waste from ships, as well as passively fished waste, and includes fishing vessels and recreational craft in the indirect fee regime. This reduces some of the disincentive caused by specific waste fees to bring back fished up waste and gear ashore. However, there is no compensation for the inconvenience of sorting and storing the waste on board, some of which will not be from the vessel concerned.
  - Requires port reception facilities to effectively implement the waste hierarchy in the context of management of waste from ships, including the separate collection of waste from vessels in port in view of further reuse/recycling. That separate collection obligation does not, however, require separate collection of fishing gear. Also the obligation to collect and subsequently treat waste would thus fall on the ports and their fees for ships, including notably small-scale fishers, would increase, unless compensated by other sources such as extended producer responsibility schemes. The cost increase could be considerable notably in small fishing ports which currently have either no, or very small port reception facilities.
  - Dedicated enforcement regime for fishing vessels over 100 GT (minimum 20% inspection target)
  - The Commission's proposal for a revision of the Port Reception Facilities Directive was intended to be one of several measures contributing to the Commission's Circular Economy Strategy[70] and the Commission's Strategy on Plastic[71]. Accordingly, the Commission's proposal for a revision of the Port Reception Facilities states that: "*additional measures for reducing lost or abandoned fishing gear are examined, such*

[70] COM(2015)614 final
[71] COM (2018) 28 final

as extended producer responsibility and deposit-refund schemes for commonly littered fishing gear"[72].

- Fisheries Control Regulation:
  - Full implementation of the current requirements to mark gear (Article 8)[73] to carry retrieval equipment on board, to retrieve lost gear or to report its loss in case it cannot be retrieved (Article 48). A planned revision will introduce daily electronic reporting for all vessels and remove the exemption of small vessels from the obligation to carry retrieval equipment. However, this will increase costs for fishers without adding any positive incentive to bring more gear back to shore.
- European Maritime and Fisheries Fund (EMFF)
  - 2014-2020: includes operations targeting marine litter, including removal of litter from the sea, and infrastructure improvements at ports.
  - Post 2020: It is envisaged, in line with the Plastics Strategy, to make marine litter a funding priority under the new programming period.
- The UN Food and Agriculture Organisation voluntary Guidelines on the Marking of Fishing Gear adopted in February 2018 are expected to be endorsed in July 2018 and subsequently implemented.

Finally, the implementation of the actions included in the EU Plastics Strategy and the Communication on the interface between chemical, waste and product legislation are also relevant.

5.2.2. Set up of new EU level measures to reduce marine litter in options 2 and 3

Measures for SUP are proposed as part of option 2 and for fishing gear as part of option 3. The approach takes into account differences in design, material and chemical composition, use and pathways for littering between products.

For each product, there is a ladder of measures with the bottom of the ladder being the current amount of litter caused by a product. The baseline scenario in all cases already leads to a first step up the ladder, leading to an impact on the level of littering of each product. The subsequent steps of the ladder are determined by the policy measures that could lead to a reduction of littering: the more ambitious the measures, the bigger the reduction in littering. Different steps of the ladder may require different legal instruments to enable them.

For some products, the ladder can be climbed all the way to the top (in other words, if the product is banned, marine litter from EU sources would be completely stopped). For other products, the Impact Assessment will show that it is only possible or desirable to climb part of the way, for example, because there are no obvious suitable alternatives (such as currently for cigarettes, sanitary applications, balloons).

[72] Explanatory memorandum, section 1
[73] Detailed requirements are included in the Control Implementing Regulation

5.2.3. Sub-option 2a to 2d: Single use plastics

The analysis for single use plastics is undertaken on a product-by-product basis. Annex 6 goes through the analysis in detail, but the main steps are set out here and continue in Section 6.2.

Step 1: A range of measures was identified that could cover some or all of the different products. These are measures either taken by some regions or Member States or at the international level and / or identified in discussions with experts and stakeholders. They are in broadly increasing order of ambition:

- Information campaigns – to raise awareness and based upon using behavioural insights;
- Voluntary action – in the form of commitments or agreements with business and industry;
- Labels - the mandatory labelling of specific products to inform the consumers on the potential implications in terms of marine litter of unappropriated behaviour (e.g. such as "do not litter" or "do not flush");
- Extended producers responsibility (EPR) systems – for packaging EPR is already an existing obligation but it does not cover clean-up which would be added. For non-packaging, there is no existing EPR obligation, but the new measure would make the minimum requirements of the new waste legislation mandatory. In addition, it would add the responsibility to cover clean-up costs (see also sub-option 3a to 3b);
- Specific Requirements on Product Design, in particular tethering the cap to a bottle;
- Putting in place Deposit Return Systems for beverage containers (or equivalent measure);
- Reduction targets for specific single use plastic products, with Member States free to choose the measures to reach the target, for instance through a charge. These may make sense when alternatives exist in some contexts, but not for all. It would allow Member States freedom in terms of the policy measures they pursue;
- Bans of SUP items;
- Setting technical standards for Waste Water Treatment Works (WWTW) and Combined Sewer Overflows (CSOs): "best practices for WWTW".

Each measure pushes the substitution of single use products by shifting behaviour towards alternative use models, multi-use versions or a substitution of the plastic in the single use item. In this last case, plastics would be replaced by materials which biodegrade in the marine environment in a sufficiently short timeframe to avoid harm to human health and the environment, such as paper and wood which have not been treated with hazardous chemicals that can be released into the environment. Testing potentially biodegradable plastics would require an accepted scientific standard on marine biodegradability, currently lacking at EU level[74].

[74] Currently, few test methods for the assessment of the biodegradation of materials in the marine environment are available from ISO and ASTM. No European CEN test method has been developed so far. Marine biodegradability pre-normative research will be the focus of a H2020 SC2 2019 research topic.

The measures would trigger responses in the market. For example, there would be research and innovation into material and product substitution (plastics and other types) making the product more cost-effectively recyclable, biodegradable or harmless when littered.

The Stakeholder consultation confirmed the need for a range of measures adapted to different SUP products. An EU-wide prevention target was preferred. With respect to regulatory measures, such as bans, the importance of public support was highlighted. Discussions around the limitations of potential measures highlighted in particular that:

- There is limited evidence on the effectiveness of awareness raising campaigns, which are not sufficient as a standalone measure.
- Bans are a good way of enforcing the redesign of specific low-value items but can interfere with the operation of the single market if applied at (sub) national level.
- Charges were seen as a preventive measure, which can influence consumer behaviour; and generate a new stream of revenue. Industry representatives highlighted, and others agreed, that a legislative approach was needed to ensure broad application and a level playing field.
- Setting targets for reduction in consumption of specific items was generally seen as an appropriate measure for EU-level action.
- An alternative option is requiring that SUP are not given away free at the point of sale.

Reactions to the Impact Assessment Roadmap also argued that the diversity of SUPs mean that a differentiated approach is required depending on whether plastic marine litter is the result of items that can be profitably recycled, items for which more sustainable alternatives exist, or finally items for which there is no readily available alternative.

Step 2: The availability of alternatives to Single Use Plastic items was considered, ranging from alternative business models, multi-use products, single use non-plastic alternatives, or different consumer behaviour. Annex 3 includes a non-exhaustive list of the single and multi-use alternatives available for the different products, but for example:

- For some products, alternatives are available with lower environmental impact if the items were still littered, such as plastic cotton bud sticks moving to paper stemmed, or wood substitutes that would pose no inconvenience to consumers, while reducing the negative impact if littered.
- For other products, the preferred alternatives might be a mix of change in model, product and material. Therefore, reusable cutlery offers a clear alternative to single use and if reuse would be difficult, there should be a material substitution (e.g. untreated wood) and items should be recyclable, in line with the waste hierarchy.
- For some other products, the acceptability of the available alternatives is less clear, such as plant-derived cellulose filters for cigarettes (although the market share of these appears to be increasing).

This is important because items with good alternatives are the best candidates for demanding measures. For items for which the market for alternatives is still developing, then there is a need for measures to promote new business models and alternative materials. Meanwhile, for items for which legislation already exists (bottles) or without substitutes (cigarette butts…) then the best measures may be more soft measures such as awareness raising and producer's

responsibility to pay for clean-up. Table 6 below groups the items broadly by alternatives, but it should be noted that each has its own specificities and so this is only indicative.

Table 7. Product matrix according to availability of alternatives to SUP products

Items with none or difficult alternatives	Items with some alternatives	Items with clear alternatives
Cigarette butts Beverage bottles Crisp packets and sweet wrappers Sanitary towels Balloons	Food containers Cups Wet wipes	Cotton bud sticks Cutlery, straws and stirrers Balloon stick

Step 3: The feasibility of the measures was considered for each product. For example, for 'drinks bottles, caps and lids', feasible measures would include information campaigns, voluntary agreements, product design, a deposit return systems or equivalent measure for beverage containers and EPR to cover cost of littering. However, for 'drinks bottles, caps and lids', best practices for WWTW would not be feasible (they would have no effect as this is not a relevant pathway). Across the different products, around 80 to 90 measures are feasible.

Step 4: Four sub-options were generated. These involve choosing amongst the 80 to 90 feasible measures available and packaging them into four sub-options (a, b, c and d). Some comments on the way the sub-options are put together:

- The effectiveness is measured first by the decrease of litter and in particular marine litter. The choice between measures is based on the availability of alternatives, impact on convenience for the consumer, implementation feasibility and further reduction potential. This is relevant for the choice between reduction targets and bans.
- It does not make sense to present sub-options with the same measure or intensity for all products. For example, presenting a sub-option of a ban for all products would not reflect the availability of alternatives or the importance of different drivers for different products. Hence, the four sub-options include different measures for different products reflecting their alternatives, pathways and drivers;
- The criteria for going from sub-option 2a to 2b to 2c to 2d is that each steps involves increasing effectiveness towards the general objective of curbing the negative impacts arising from marine litter but also, in general, increasing implementation difficulty and or costs.
- Not all products have additional measures in each sub-option. For example, sub-option 2c reflects additional effort on wet wipes, cutlery, straws and stirrers and balloon sticks. For the other products, the measures are unchanged from 2b.
- This approach presents packages of measures, but of course, this is based on aggregating analysis of individual measures on individual products and there is scope to move measures between different sub-options. The underlying analysis is presented in Annex 6 (Tables 25 to 28) and allows for an individual measure for an individual product to be identified in isolation and moved between sub-options.

The table below presents in tabular form the different components of each sub-option.

Table 8.Option 2 Product-sub option matrix with modelled measures

Item	Sub option 2a	Sub option 2b	Sub option 2c	Sub option 2d
Cigarette butts	**Information campaigns** **Voluntary action**	Information campaigns Voluntary action **EPR-cost of litter**	Information campaigns Voluntary action EPR-cost of litter	Information campaigns Voluntary action EPR-cost of litter **Label** **Reduction target (30% by 2025, 50% by 2030)**
Drinks bottles	**Information campaigns** **Voluntary action**	Information campaigns Voluntary action **EPR-cost of litter** **Product design**	Information campaigns Voluntary action EPR-cost of litter Product design	Information campaigns Voluntary action EPR-cost of litter Product design **DRS for beverage containers**
Cotton bud sticks	**Information campaigns** **Voluntary action** **Label**	**Ban**	Ban	Ban
Crisp packets	**Information campaigns** **Voluntary action**	Information campaigns Voluntary action **EPR-cost of litter**	Information campaigns Voluntary action EPR-cost of litter	Information campaigns Voluntary action EPR-cost of litter
Wet wipes	**Information campaigns** **Voluntary action** **Label**	Information campaigns Voluntary action Label **EPR-cost of litter**	Information campaigns Voluntary action Label EPR-cost of litter **Reduction target (30% by 2025, 50% by 2030)**	**Best practices for WWTW**
Sanitary towels	**Information campaigns** **Voluntary action** **Label**	Information campaigns Voluntary action Label **EPR-cost of litter**	Information campaigns Voluntary action Label EPR-cost of litter	Information campaigns Voluntary action Label EPR-cost of litter **Reduction target (25% by 2030)**
Cutlery; Straws; Stirrers	**Information campaigns** **Voluntary action**	Information campaigns Voluntary action **EPR-cost of litter** **Reduction target (30% by 2025, 50% by 2030)**	**Ban**	Ban
Drinks cups & lids; Food containers	**Information campaigns** **Voluntary action**	Information campaigns Voluntary action **EPR-cost of litter** **Reduction target (30% by 2025, 50% by 2030)**	Information campaigns Voluntary action EPR-cost of litter Reduction target (30% by 2025, 50% by 2030)	Information campaigns Voluntary action EPR-cost of litter Reduction target (50% by 2025, 80% by 2030)
Balloons	**Information campaigns** **Voluntary action** **Label**	Information campaigns Voluntary action Label **EPR-cost of litter**	Information campaigns Voluntary action Label EPR-cost of litter	Information campaigns Voluntary action Label EPR-cost of litter
Balloon sticks	**Information campaigns** **Voluntary action** **Label**	Information campaigns Voluntary action Label **EPR-cost of litter**	**Ban**	Ban

Additional measures compared to the sub-option on the left are written in **bold**:

- All measures in 2a are in bold because they are not in the baseline. To follow an example, for cigarette butts, in 2b EPR for the cost of litter is added, 2c is the same as 2b for this product and then 2d includes labels and a reduction target.
- When a ban is introduced, then there is no need for labels, information campaigns etc.

Sub-option 2a

The first sub-option is relatively cheap and straightforward to implement, but has a low effectiveness with regard to curbing the negative impacts arising from marine litter, especially against the baseline option. Broadly, there are two groups of measures:

- information campaigns and voluntary actions for all SUP in scope,
- measures related to labelling of improperly flushed items: cotton bud sticks, wet wipes and sanitary towels (the main driver for marine litter for these items, is that they are flushed, while they should not). This labelling would inform the consumers on the potential implications in terms of marine litter of for example flushing. Labelling would also apply to balloons (informing consumers not to let fly balloons in the open air as they potentially harm nature).

The public consultation revealed scepticism about the effectiveness of awareness and labelling measures alone, with only 30% of respondents believing that these would be "very effective", although higher levels were registered from some sectors, notably plastics converters (63%) and manufacturers (58%). Similarly, voluntary actions by business were considered "very effective" by only 29% of respondents, again with some variations, for example with fewer plastics converters and manufacturers finding them very effective (20% and 19% respectively), but more retailers and food outlets (41% and 50%) considered voluntary actions very effective.

Sub-option 2b

The second sub-option is more effective, while becoming more challenging to implement (bringing with it more costs and burden for those affected). It includes the same measures as the first sub-option, and in addition:

- A ban of plastic cotton bud sticks, where there is a very clear alternative. This also means that information campaigns etc. are dropped for this product).
- EPR to contribute to the cost of cleaning up litter for SUP that are either frequently littered (cigarette butts, drinks bottles, crisp packets and sweet wrappers, straws, stirrers, drinks cups and lids, food containers, balloons) or flushed when they should not be and then end up in the sea (wet wipes, sanitary towels);
- Product design measures for drink bottles related to tethered caps;
- Reduction targets for single use plastic products where there are alternatives on the market and/or behaviour could change (cutlery, straws, stirrers, drinks cups and lids, and food containers: 30% by 2025 and 50% by 2030). Member States will be obliged to introduce national reduction targets, i.e. legally binding reductions in consumption from a base year, or other measures that would obtain the same result, such as levies, deposit refund systems, nudging policies (behavioural response policies) etc., which makes this approach similar to that in the Plastic Bags Directive.

Sub-option 2b implies an increasing trade-off between being ambitious in terms of expected impact (see Annex 6) and being feasible to implement, e.g. alternatives are already on the market, or Member States have sufficient control on how to tailor measures to local conditions (subsidiarity principle).

In the public consultation 44% of respondents considered legislative requirements to use alternative materials as "most appropriate (effective, proportionate, economically efficient and socially acceptable)", an option amounting effectively to a ban on plastic versions of this product. About 40% considered extended producer responsibility schemes as appropriate for such items.

Respondents to the public consultation overwhelmingly favoured the use of EPR schemes to cover the costs of cleaning up litter, with 91% considering that cigarette companies should contribute financially to clearing up of cigarette butts in this way, and 6% against (20% of those in the "manufacturers" category were against). 79% believed that producers of sanitary items should contribute to cleaning up costs of sanitary towels, with 11% against. For bottles, 33% of respondents expressed support for reduction targets and 20% for design requirements. These responses were on an "either-or" basis for first preference, and it is not clear how many would opt for design measures in addition to their first preference.

With regard to products where there are alternatives on the market and/or behaviour could change, the public consultation indicated support for a mix of measures, with some variations depending on category of respondent.

Table 9. Public consultation – views on responses by stakeholder group

CUTLERY	Legislative requirements for substitute materials	Minimum Design Requirements	Reduction Target for Use
All respondents	**42%**	**14%**	**34%**
Food outlets & restaurants	71%	14%	29%
Retailers	51%	27%	32%
Waste collectors	56%	26%	41%
Importers	54%	31%	8%
Brands	18%	18%	27%
Manufacturers	34%	33%	17%
Plastics converters	41%	39%	17%
Recyclers	62%	28%	23%
R&D	57%	18%	45%
Tourism	55%	18%	39%
Wholesalers	25%	50%	8%

For other products for which there are alternatives on the market, the overall balance of appropriate measures was similar, but legislative measures for substitute materials were considered slightly more pertinent in relation to caps & lids and food containers.

Table 10. Public consultation – views on responses by products

	Legislative requirements for substitute materials	Minimum Design Requirements	Reduction Target for Use
Straws & Stirrers	42%	14%	34%
Cups	42%	14%	35%
Caps & Lids	45%	17%	28%
Food Containers	47%	17%	27%

Breaking down the reduction target to look at how Member States might achieve reductions, there was a fairly balanced split between measures. For example, in respect of single use

drinks cups, 34% of respondents expressed a preference for direct measures such as restrictions or charges, 31% preferred use of incentives (such as price reductions) for consumers bringing reusable cups onto premises, and 30% felt preferred awareness raising measures.

Sub-option 2c

The third sub-option would have a higher effectiveness still. It includes the same measures as the second sub-option and includes in addition:

- reduction targets for wet wipes, which was not included in sub-option 2b as the alternatives are less clear: 30% by 2025 and 50% by 2030;
- bans for a group of single use plastic items, where there are alternatives on the market: cutlery, straws and stirrers, balloon sticks (meaning other measures related to these products are no longer needed);

The public consultation showed strong support (93% of respondents) for policies to phase out disposable non-biodegradable plastic tableware (such as cups, plates, cutlery and stirrers) in favour of reusable alternatives or those made with more biodegradable materials. However, about 50% of plastics converters were against such actions.

Sub-option 2d

This sub-option has the highest effectiveness in terms of reducing marine litter but would be the most challenging and costly to implement. It includes the same measures as sub-option 2c (unless these became redundant, e.g. in case of a ban). The measures, which reflect differences in alternatives and feasibility across products, include:

- Best practices for waste water treatment: for wet wipes, as the pathways are the key issue and there is no easy alternative. This would require a longer time horizon and large investments, which EPR could not cover. Investing in improving the wastewater infrastructure makes sense for several reasons – i.e. to further reduce the release of the 'classical' organic pollutants. Better capturing wet wipes would be a positive consequence, but probably not a sufficient argument for these additional investments.
- Deposit refund system (DRS) or equivalent measure[75] for beverage containers. The added value may vary between Member States. A DRS for beverage containers is implemented in some Member States (resulting in increased collection rate and reduced littering), but faces opposition driven by a (sometimes real, sometimes perceived) cost argument. While there is public support for DRS (see Open Public Consultation), in countries where EPR schemes are well established, the added value of DRS systems might be limited. Discussions ongoing in several Member States show that the industry (producers of products) is generally not in favour, because it might require investments in new infrastructure in addition to their responsibility to

[75] Experience shows that DRS systems are able to reach high levels rates of capture of bottles placed on the market. Equivalent systems could also be set up for instance in combination or in complement to existing EPR systems targeting similar capture rates.

set up and maintain existing separate collection systems that target similar and other waste.
- EPR to cover the full cost of littering crisp packets, sweet and wrappers;
- Reduction targets for sensitive SUP, from a public opinion perspective: sanitary towels (25% by 2030), and cigarette filters (50% by 2025, 80% by 2030).
- Higher reduction targets for drinks cups and lids, and food containers (50% by 2025, 80% by 2030) compared to sub-options 2b and 2c (30% by 2025, 50% by 2030).

The public consultation showed 47% of respondents were in favour of deposit return schemes (with brands, importers and manufacturers less enthusiastic). 77% of respondents stated they would be prepared to pay a small charge on plastic bottles, to be refunded on return, with a further 7% saying that this was already the case in their country.

5.2.4. Sub-option 3a to 3b Fishing gear

Actions already underway or planned as part of the baseline scenario will already reduce the amount and inflow of plastic from fishing gear in the sea. However, whilst reducing some financial disincentives for fishermen to return their damaged, end-of-life or fished up gear to ports, there would still be no incentives for actions that mean extra work for them in terms of sorting or storing waste fishing gear on board other than ad-hoc actions organised by local authorities.

In addition, increases in port fees due to the need for additional waste management facilities, such as for separate collection and sorting in PRFs would result in cost increases for fishers notably in small fishing ports which currently have either no, or very small PRFs. This is already being flagged as a potential issue in the on-going negotiations on the revised PRF Directive. Nor would there be specific incentives for organising dedicated waste and recycling stream for fishing gear once returned to port, mechanisms to share best practice and increase efficiency of retrieval operations[76] or development of more environmentally-friendly gear. Finally, current measures address the return to ports only, but do not address the overall aspects of treating waste fishing gear outside the context of port reception facilities, such as in aquaculture installations.

5.2.4.1. Extended Producer Responsibility

Extended Producer Responsibility (EPR) is a policy approach under which producers are responsible for the separate collection and subsequent transportation and treatment of products at the end of their life. It allows environmental costs, including costs of waste gear recovery and recycling, to be internalised by "polluters". Establishing an extended producer responsibility scheme could be a mechanism to support improved waste management services for fishing gear waste, including separate collection, sorting and cleaning, recycling, education and awareness, research and possibly even facilitate retrieval operations for lost fishing gear. This would be an additional measure to financially support the appropriate return, separate collection and subsequent treatment of waste fishing gear. This would reduce the cost for ports of management of waste gear returned to port and consequently would have

[76] Active fishing for litter operations.

a softening impact on any potential increases of port fees affecting the fishing sector as a result of the revised PRF Directive. In doing so, it enables full realisation of the expected positive impact of the revised PRF Directive on increasing the returning of fishing gear. It also involves fishers and fishing gear producers in taking full responsibility for the environmental impact of their gear whilst ensuring fair distribution of costs.

Although no EPR schemes yet exist for plastics used in the fisheries and aquaculture sectors, within the framework of marine environmental law there are compensation schemes (i.e. Civil liability and Fund Conventions regulating compensation for oil pollution damage caused by tankers). These schemes also include subsidiary or 'top-up' liability for cases where the actual polluter is not known (such as the oil industry's IOPC Funds, 2018). EPR schemes may shift consumption away from harmful products or discourage the use and/or abandonment of plastic components of fishing gear, which are easily damaged during use, e.g. plastic dolly rope, and polystyrene floats and buoys not sealed in a protective cover.

Despite EPR being, in theory, an individual obligation, in practice producers and manufacturers often exert this responsibility collectively, including in how fees are set, modulated, and passed on to users. In cases where the product market is competitive, fees are often absorbed by the producers rather than passed on wholesale to users. In collective schemes, a Producer Responsibility Organisation (PRO) is set up, either by producers or through legislation, to implement the EPR principle on behalf of all the adhering companies (the obligated industry). It then becomes responsible for meeting the recovery and recycling obligations of the individual producers.

The responsibility of the producer could include:

- handling the waste stream. The producers are responsible for the separate collection of the material from the port and transporting it for treatment (recycling, incineration or landfilling) and related monitoring obligations under the applicable waste legislation. It would operate in a similar way to the Icelandic Recycling Fund[77] (Úrvinnslusjóður) which is funded by a levy on imported goods or local production.
- a deposit scheme. The producers are responsible for administering and financing a scheme whereby fishermen are paid for the return of end-of-life, damaged gear or fragments of gear. In order to reduce administrative costs, the amount returned would not distinguish between different gears or plastics but rather be determined by the weight of litter returned with the sole proviso that it be fishing gear. The deposit would be included in the price of gear. A scheme in Korea whereby fishers are paid for gear returned to port is reported to be "highly effective in terms of recovery and disposal of gear"[78].
- achieving a target for recycling of fishing gear.
- the organisation of retrieval operations. This would include maintenance of a database of lost gear and retrieval operations including their cost, duration and success rate which would guide subsequent retrieval operations.

[77] Gudlaugur Sverrisson, Icelandic Recycling Fund Marine litter – The Icelandic approach to take back of discarded fishing nets, presentation in Brussels, July 2017

[78] Macfadyen et al, 2009 Abandoned, lost or otherwise discarded fishing gear, UNEP

5.2.4.2. Product design and distribution

This would include a potential ban or levy on materials susceptible to loss and/or difficult to recycle and substitution of plastic products in fisheries such as plastic feedbags in aquaculture or polystyrene fish boxes. This measure would achieve a phase-out or reduction in consumption of the use of materials that are difficult to recycle (e.g. combination cordage i.e. that made of mixed materials) or susceptible to loss and/or abrasion (e.g. dolly rope). It could be particularly appropriate for fish aggregating devices (FAD) which float and drift with currents and are difficult to locate and recover. The particular challenge of biodegradability may apply to a lesser extent as the conditions under which the material should operate and degrade are known.

5.2.4.3. The options

These measures can be grouped into three options that are not mutually exclusive.

Option 3a	Extended Producer Responsibility for handling waste stream
Option 3b	Extended Producer Responsibility including deposit on fishing gear Extended Producer Responsibility with a recycling target
Option 3c	Extended Producer Responsibility for coordinating retrieval

6. ANALYSIS OF IMPACTS

6.1. Types of impacts

Environmental impacts

Estimates are provided for the main environmental benefit, by looking at the **reduction in plastic marine littering rates**. Reductions in marine littering from SUP will often be associated with reductions in terrestrial littering and lead to changes in production, and improved waste prevention. This leads to changes in **greenhouse gas emissions**.

The focus on reducing plastic marine litter could have unintended consequences (are you switching to something that causes different problems?). **Life Cycle Analysis (LCA)** was undertaken to compare the environmental impacts of the alternatives to SUP, both non-plastic single use and multi-use items. The main parameters show a decrease in impacts, though for some options, there might be a minor increase in land use due to a switch to paper and wood.

Monetised estimates of the environmental impacts are provided where possible but need to be treated with caution. In particular, direct comparisons between the figures used for fishing gear and SUP should not be made given the different methodologies and assumptions used.

Economic and social impacts

Measures to reduce the littering of single use plastic, especially regulatory measures, will entail some **compliance costs**, falling both on the public and on the private sector, and perhaps being passed on to consumers, to ensure implementation and enforcement. The extent will depend on the choice and the exact design of the measures to be implemented[79].

6.2. Analysis of Single Use Plastic Sub-options

6.2.1. Approach

Single use plastics is analysed on a product-by-product basis. While section 5 went through the four steps related to building sub-options, section 6 examines how they were analysed.

Step 5: The model was populated with baseline data covering baseline growth rates for consumption of the different products, recycling assumptions, littering rates etc. For the SUPs considered here, the total tonnage of items ending up as litter is 270,174 tonnes, while the tonnage of items flushed sums to 41,896 tonnes. Of this 312,070 tonnes of items, the amount then entering the marine environment is calculated to be around 15,604 tonnes of SUP in the baseline option (option 1). Less than 5% of plastic land litter ends up as plastic marine litter.

The model is an adapted waste model. Some mass flow aspect, e.g. and in average on littering, were used for the modelling work under the Plastics Strategy. This was built upon for the different products, as waste models do not normally model down to such a specific product level as e.g. stirrers. Baseline projections reflect trend analysis and the impact of recycling and landfill target rates specified in EU legislation. Many of the waste management related impacts, including externalities, were taken from the European Environment Agency's 'European Reference Model on Municipal Waste Management', which has been developed over the last 10 years, and thoroughly tested. This was complemented by further LCA studies of the different products and possible alternatives.

Step 6: Modelling assumptions were made about the costs and impacts of different measures. This involved an examination of a 'ladder' for each product (see Annex 6). This allows for estimation of impacts throughout the economy. Important assumptions for SUP are how different measures affect littering rates, consumption rates (and the split between SUP and alternatives both multi use and non-plastic). This needs to reflect the impact of different measures on the different pathways and underlying drivers. In addition, the costs to different actors needs to be estimated for each of the different measures. These assumptions are based on literature review and past experience. Changing them would not change significantly the conclusions of the assessment.

[79] In Ireland, where measures to reduce single-use plastic bags have been successful, charges are paid into an environment fund. Annual revenues have risen to €23.4m in 2009. Collection and associated administration costs are low, at about 3% of revenues. The remainder of the revenues are used to support environmental programmes, such as recycling centres and cleaning up illegal landfill sites.

Step 7: The different measures were modelled and results presented for the four sub-options. Each of these sub-options results in different environmental, economic and social impacts, which are modelled compared to the baseline scenario.

6.2.2. Results of the environmental analysis

Sub-option 2d leads to the largest reduction in plastic marine litter. Reduction estimates were first made by weight (tonnes) and then translated into items by count.

Table 11. Percentage reduction for Top 10 SUP compared to the baseline (by weight & count)

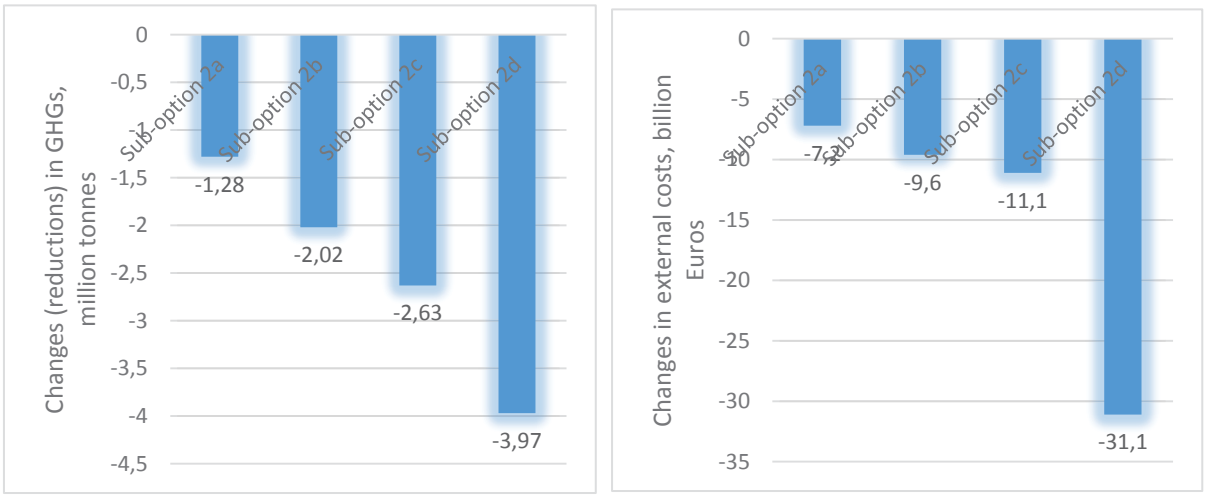
	By weight	**By count**
Sub-option 2a	21%	**16%**
Sub-option 2b	32%	**50%**
Sub-option 2c	35%	**56%**
Sub-option 2d	82%	**74%**

Table 12. Percentage reduction by count and by item (millions of items)

Item	**Marine litter, millions of items, predicted in 2030**	**Scenario 2a**	**Scenario 2b**	**Scenario 2c**	**Scenario 2d**
Cigarette filters	4,778	-693	-2,628	-2,628	-3,703
Wet wipes	775	-112	-112	-112	-388
Straws	372	-102	-330	-372	-372
Cotton buds	95	-12	-62	-62	-62
Drinks bottles	182	-34	-23	-157	-157
Sanitary towels	252	-30	-37	-37	-90
Drinks cups and lids	146	-27	-113	-113	-132
Crisp packets	74	-11	-41	-41	-41
Food containers	64	-18	-50	-50	-58
Cutlery	18	-5	-14	-18	-18
Stirrers	20	-5	-18	-20	-20
Grand Total	**6,776**	**-1,049**	**-3,426**	**-3,609**	**-5,041**

Estimates of external costs are provided. These are significant with, for example, sub-option 2c having reduced costs (benefits) of €11.1 billion Euros in 2030 (these calculations use monetised estimates of disamenity from litter in particular and are only partly financial benefits).

Figure 9. Environmental impacts a) Changes in GHG Emission (million tonnes CO2 equivalent); b) changes in external costs, €billion



6.2.3. Results of the economic analysis

Half of global plastics production is located in Asia and 19% in Europe. Analysis suggests that most single use plastic items are produced outside Europe. In the context of generally buoyant and increasing demand for plastic products, producers (plastics converters) are likely to be negatively affected by any reduction in demand for single use products but they have an opportunity to redirect production to reusable and recyclable items.

There is no detailed information on what proportion of the products put on the market by EU and non-EU plastics converters is composed of the items identified as most likely to be littered, and so it is difficult to see how impacts fall in or outside the EU. The sector is expanding, so the possibilities to divert from production of low-value disposable SUP products to other markets are therefore clear. Higher value products for construction, insulation, agriculture, automotive, telecommunications and electronics industries tend to be made with other types of plastic (PE, PVC, PUR, PS and others) which account for more than 70% of EU demand from plastics converters.

Trade figures suggest that Asia accounts for about 57% of global exports of disposable plastic tableware, compared to just over 25% for the EU, with Asia the primary source of most SUP items. Table 11 provides an overview of production sources for SUP. There is less information on where the production of multi-use plastics and, especially, non-plastic alternatives will come from but there could be future opportunities for EU markets (see Annex 6). For the alternative materials for single use items, innovations and solutions could come from the bio-economy.

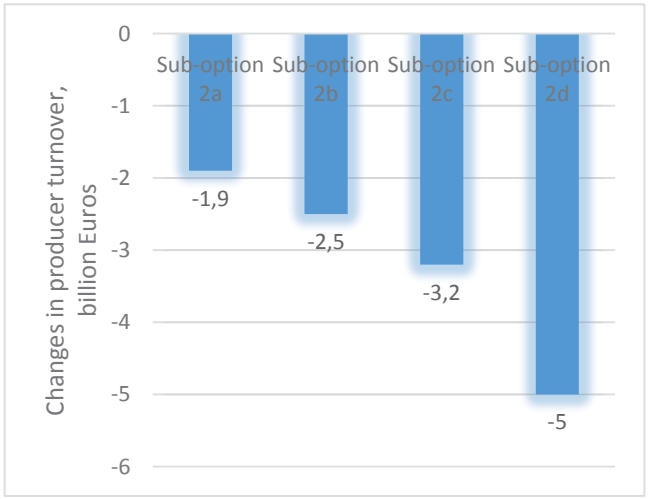
Table 13. Production sources for SUP

Item	Production scenario
Cigarette filters	Acetate tow is produced by five main companies, based in the US, Japan and Germany. It is undetermined where cigarettes are principally produced.
Drinks bottles	Drinks bottles are mainly produced and filled at factories within the EU.
Cotton buds	Europe is a net importer of cotton buds. Countries in the Asia-Pacific region (specifically China, India, Taiwan and the Philippines) and the US are the major

Item	Production scenario
	manufacturers of cotton buds, due to labour costs and/or the availability of cotton.
Crisps / sweets	Flexible packaging is produced in rolls that are used in product manufacturing plants to make crisps packets and sweet wrappers. The original flexible material is mainly produced in the EU.
Wet wipes	The majority of nonwoven wipes used in the EU are produced in the geographical region of Europe. The report includes Turkey within this region, who is a major producer of nonwoven wipes for Europe, so further analysis is needed to determine whether wet wipes production is centred within the EU or the non-EU geographical region.
Sanitary towels	The European geographical region is a net exporter of hygiene products such as sanitary towels.
Cutlery	These items are predominantly and increasingly imported from the Asia-Pacific region into Europe. For example, Huhtamaki, one of the principal food service packaging businesses in Europe, owns 14 manufacturing centres in India. An internet search for suppliers of plastic stirrers by location reveals 127 suppliers located in the EU, compared with 214,112 in China, 4,982 in Honk Kong and 1025 in Vietnam. Industry estimates on balloon sticks suggest that more than 50% come from China, but that between 50 and 75% of balloons on the EU market (total market of about €540m p.a.) are manufactured in the EU.
Straws	
Stirrers	
Drinks cups	
Drinks cup lids	
Food containers	
Balloon sticks	

Overall, producers' turnover would fall under option 2 relative to option 1, but not significantly compared to the market size; and, much of this production takes place outside the EU.

Figure 10. Producer Turnover (2030), € billion (2018 prices)



For food and drink related items (food containers, cups and cup lids, cutlery, straws and stirrers), the food service (HoReCa) industry and retailers pay for the single use plastic items that they provide to customers 'free of charge'. Although the cost might not be evident to customers, the consumer will normally cover it in the overall price. With a shift to reusable items, a single upfront purchase by the retailer will avoid future regular costs of purchasing the single use items, and thus may lead to a saving.

There will be a cost to providing reusable items for consumption on site, but savings from not providing single use items. The balance of the costs and savings will vary for different

retailers and determine whether a switch away from SUP can 'pay for itself' over time. However, the shift to non-plastic single use alternatives may lead to an increase in costs to retailers if these are more expensive, and if they do not to pass these costs on to consumers.

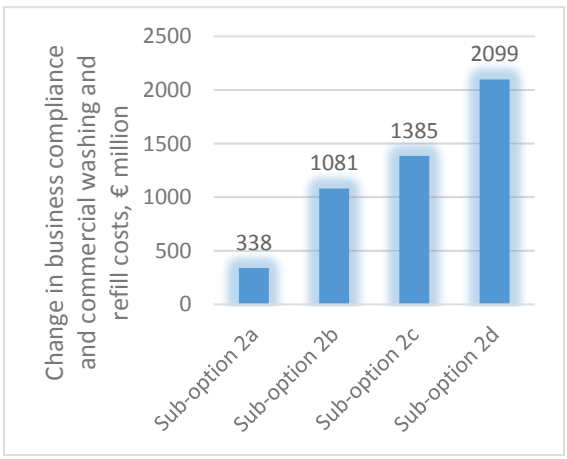
For other single use items such as wet wipes, sanitary towels, and cotton buds, that retailers sell on directly to customers (rather than use to contain the food or drink they are selling), the impacts will vary based on the difference between the wholesale price and the retail price of the non-plastic single use alternative. Where retailers sell multi-use alternatives, while the number of sales will be lower, the effect on profits will depend on the per item margin that the retailer makes versus the margin on the current single use plastic items.

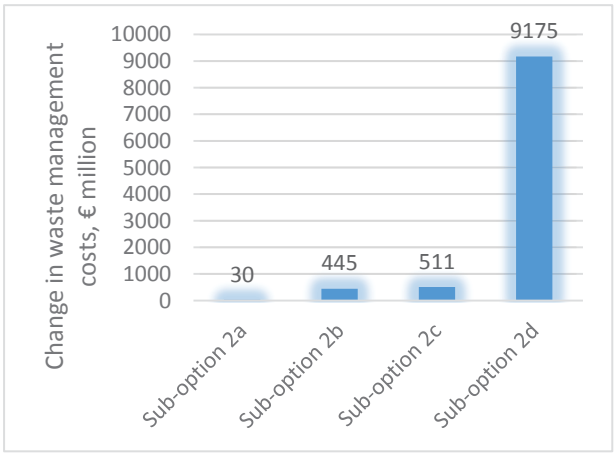
For retailers engaged in a deposit refund scheme, there will be costs to operating refill schemes, or from washing items. However, these costs may be compensated through the receipt of handling fees for every used beverage container returned.

Waste prevention will lead to some savings of waste treatment for public authorities (where public authorities cover such costs). Reduced levels of litter also mean reduced costs of litter collection and management. Recycling costs generally fall, but are forecast to increase under some measures, such as where DRS for beverage containers is introduced. Overall, costs increase across the scenarios, and are much higher for scenario 2d because of the assumption that screens are fitted as best practice for WWTW.

The figures below show a) the costs for businesses of complying and the cost of washing and refill schemes (not shown are information campaign costs, that may be paid for by Member States or business) and b) the change in waste management costs (including sewerage treatment). These are partial estimates – other businesses will benefit from production of alternatives, and there will be direct savings that offset (partially or fully) some of the costs.

Figure 11. a) Business compliance and commercial washing and refill costs, € million (2018 prices) b) Waste management costs, € million (2018 prices)



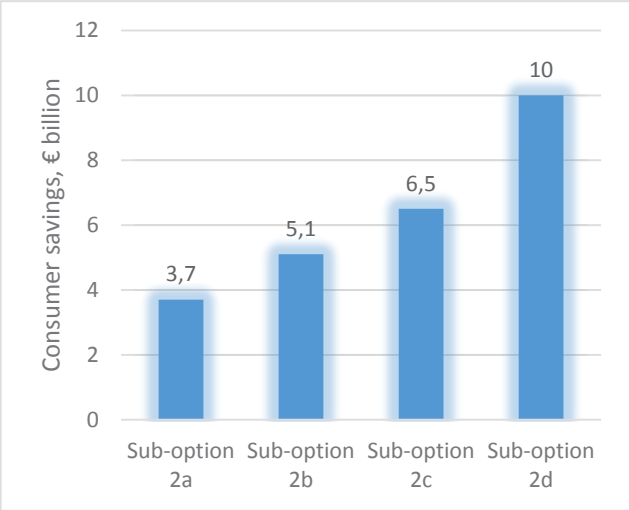


There are likely to be financial benefits for consumers. When consumers use their own MU items, they will need washing in order to keep them clean and usable. Therefore, there may be some additional costs from washing the items. However, as they are no longer purchasing many SUP items, the overall cost is likely to fall. For individual consumers, the impacts will vary depending on their consumption habits and their own pre-existing preferences in respect of using reusable items. For example, a nudging policy might be to expand consumer choice

by making tap water an available alternative to having to buy (or at least feeling that one has no choice but to buy) bottled water.

These elements need to be compared with convenience for consumers. However, as seen with the plastic bags Directive, the large majority of consumers will accept stringent measures in order to reduce marine litter, in particular when alternatives are available.

Figure 12. Consumer savings, € billion (2018 prices)



Most of the 50,000 companies in the plastic converters sector in the EU (who take plastic resin, in the form of pellets, powders and flakes and turn it into products and packaging) are SMEs. The effect upon them will depend upon whether their business is dependent upon SUPs, and their ability to switch to manufacturing other plastic items. As stated above, for many SUP items the majority of production takes place outside the EU.

Many retailers, especially in food service retail, are SMEs. They may be positively impacted where they avoid the need to purchase single use items that accompany or contain the food or drink they sell. Whilst reduced consumer spending will translate almost into reduce retail sales, there will be rebalancing as consumers spend their money on alternatives, and favour innovative responses. New business models will develop for making available multi use items to consumers and this could reduce costs, especially as options are scaled up.

One of the key aspects that business frequently calls for is a clear policy steer. The European Commission's Plastics Strategy has been expected for some time, and some producers have already begun anticipating and considering their options. For example, some restaurant chains are already phasing out plastic drinking straws, voluntary actions such as refill schemes are becoming more widespread, and a growing number of Member States are considering introducing deposit refund schemes for beverage containers.

Social impacts

Some small changes in employment are expected. Employment impacts are most positive with a switch to more labour-intensive practices (such as refillable take-away box schemes). These offset reduction in staffing at manufacturing related to decreased turnover. The nature and location of any impact will also depend on where saved money is spent by consumers,

and whether alternative products are produced inside or outside Europe. However, given the uncertainty around employment impacts and the possibility of rebound effects, the overall impacts on employment are not seen as significant.

Overall impacts

The modelling of the sub-options reflects an assessment of how adequately measures would address the underlying drivers and pathways of marine litter. In the baseline scenario, the evolution of two specific drivers towards an increase in marine litter, may outweigh the others, namely "wide availability of plastic as a cheap and convenient option for single use applications" and "consumer trend for convenience". Hence, the impact of proposed measures on these two drivers is especially important:

- **Scenario 2a** would address the drivers in a limited way. Information campaigns, voluntary actions and labelling could increase general awareness (e.g. on the litter issue, typical pathways, correct disposal), and thus consumer behaviour, including the trend for convenience. However, it is unclear what the outcome will be as there is little evidence of such awareness actually changings those people's behaviour.
- **Scenario 2b and 2c** would address the underlying drivers more adequately, as they go further to change consumer behaviour. Product design measures for drink bottles for tethered caps would have a direct impact on the leakage of caps into the environment. Reduction or ban of SUP items would have a positive impact on collection rates. In cases of items still leaking into the environment, damage would be mitigated when using alternatives, which are fully biodegradable under marine conditions. Well-functioning EPR schemes covering the full cost of littering crisp packets and sweet wrappers, together with cigarette filters, drink bottles, wet wipes sanitary towels and food containers would improve the management and infrastructure for collection and sorting, and address the market failure for this segment for which alternatives are currently limited. When combined with modulated fees, an EPR scheme could shift from SUP to reusable or single use alternatives, directly affecting the availability of plastics, and the linked consumer behaviour.
- Sub-option 2c offers a higher effectiveness than sub-option 2b in terms of reducing plastic marine litter, but with additional costs (though much smaller than the difference between 2d and 2c). The additional advantage of 2c over 2b is that the increased use of bans in 2c sends a clear signal and will work better in ensuring the proper functioning of the internal market by avoiding fragmentation between Member States (some Member States are already acting on items: cutlery, straws and stirrers). A ban that is not foreseen in 2b is also easier for Member States to implement. Monitoring the measures foreseen under option 2 c will also be easier for member States. Alternatives are available, so consumers are expected to accept a ban. Given these advantages, and the fact that increased environmental benefits outweigh the increased costs, 2c is an effective and efficient package of measures and so is the preferred sub-option.
- **Scenario 2d** would better address the underlying drivers, but at a higher cost (both financial and in the form of 'hassle' or possible subsidiarity issues). DRS or equivalent systems would entail additional cost (around 1,4 billion €) but would further reduce marine litter. As already shown in several Member States, deposit systems for beverage bottles have a direct, positive impact on collection and recycling, increasing collection rates and quality of the collected material, and reducing littering rates. Best practices for wastewater treatment works would improve infrastructure, increasing wet wipes collection. The main additional cost in 2d is the additional investment needed to

disseminate best practices for urban wastewater collection (around 7.7 billion Euros per annum). This measure is difficult to justify simply to solve the wet wipe issue, but is relevant to a much wider range of pollution releases. The ongoing evaluation of the Urban Waste Water Treatment Directive (UWWTD)[80] will consider the measure of 'best practices for WWTW' in more detail than above, and in a wider context[81].

All scenarios involve a shift away from SUP towards alternatives. These substitutes could include alternative business models (e.g. reuse with or without deposits), innovative product design (e.g. integrating smaller parts with larger items) and use of other materials (e.g. paper). To avoid unintended consequences regarding economic, environmental and social impact, the transition towards alternatives should be outcome-oriented and have a broad potential solution space. Such an approach would be in line with the Innovation Principle, making the legislative proposal forward-looking ('future-proofing') and innovation-friendly.

Clarity is needed on what could be labelled as "alternative". Material characteristics need to ensure full biodegradability in marine environments, which requires criteria on material degradation and related timeframe relative to the specific environmental conditions. At EU level, there is currently no accepted scientific standard on marine biodegradability which highlights the urgency for the Commission to ask the European Committee for Standardization to develop a separate standard for Marine biodegradability[82].

Table 12. Summary of model analysis per sub-option

	2a	2b	2c	2d
Marine litter by count (as % of SUP Top 10)	**-16%**	**-50%**	**-56%**	**-74%**
Marine Litter, tonnes	**-2,750**	**-4,450**	**-4,850**	**-12,070**
Change in GHG, million tonnes	**-1.28**	**-2.02**	**-2.63**	**-3.97**
External Costs, € billion	**-7.1**	**-9.5**	**-11.1**	**-30.9**
Savings for consumers, € billion	**3.7**	**5.1**	**6.5**	**10.0**
Impact on producer turnover, € billion	**-1.8**	**-2.5**	**-3.2**	**-5.0**
Information campaign costs, € million	**714**	**698**	**596**	**596**
Business compliance, commercial washing & refill scheme costs, € million	**338**	**1081**	**1385**	**2099**
Waste management costs, € million	**30**	**445**	**511**	**9175**
Employment, 000 FTE	**-3.8**	**3.8**	**4.0**	**5.0**
Feasibility	**High**	**Med**	**Med**	**Low**
Ensure Internal Market	**-**	**+**	**++**	**++**

[80] https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-4989291_en

[81] This is not a question of enforcement of the current legislation, but of the collection and the treatment infrastructures and their ability to capture and remove pieces of plastics. Some plastics are not transiting through waste water treatment plants as they are authorised to 'by pass' the treatment infrastructures in case of heavy rains (CSOs). More quantification on these issues will be provided in the context of the evaluation to be finalised by mid 2019.

[82] Currently, few test methods for the assessment of the biodegradation of materials in the marine environment are available from ISO and ASTM. No European CEN test method has been developed so far. Marine biodegradability pre-normative research was initiated on FP7 project OPENBIO and will be the focus of a H2020 SC2 2019 research topic.

- Impacts are expressed against the baseline option 1 for the year 2030, in current 2018 prices.
- Impacts do not take account of rebound effects.
- GHG emissions are given in million tonnes CO_2 equivalent in 2030, for EU changes.
- Externalities are monetised for litter removal (land and sea) using disamentity, and supplemented by LCA analysis.
- Marine litter reductions: figures expressed as a percentage of current litter from Top 10 SUP estimates which is estimated to be 15,604 tonnes per annum in total, with 86% from the Top 10.
- Feasibility represents the technical difficulty and hassle factor of undertaking the different measures for consumers and retailers.
- Analysis of the individual measures making up each of the sub options can be found in Annex 6, Section 2.4 'Model Outputs'.

In terms of their effectiveness of reducing plastic marine litter, 2d would be the most effective. However, the cost of 2d is much higher than for 2c (because in particular of the costs associated with improving waste water treatment). For this reason, option 2d is not chosen.

6.3. Impacts for Fishing gear sub-options 1 and 3a and 3b

6.3.1. Option 1 – the baseline of no action over and above those already in the pipeline

The actions underway will already have a positive impact. We will analyse the financial cost of each of these actions and the environmental benefit in terms of reduction of plastic entering the sea. From this we can estimate the economic impact.

a) We can assume that the annual input of marine litter from land, fishing and aquaculture is up to 25,000 tonnes[83] and that the amount of plastic in the ocean represents 10 years of this input, then preventing 1,000 tonnes from entering the sea or fishing out 1,000 tonnes is equivalent to reducing the impact of marine litter by 0.4%.
b) Litter causes damage to fisheries through fouling of propellers, blocked intake pipes and valves, snagging of nets, silting of cod ends and contamination of catch. Efforts to estimate the cost of this to fishers range from 1%[84] to 5%[85] of revenue. For the whole of the EU fleet, this amounts to between €70 million and €350 million per year. Thus, removing one thousand tonnes of litter would have a value to the fishing industry of between €250,000 and €1,000,000 a year.

Similarly, we can calculate the purely economic impact on other activities.

[83] See detailed analysis in Annex 7
[84] JRC Technical Report: Harm caused by Marine Litter, 2016
[85] Marine Anthropogenic Litter, Editors: Bergmann, Melanie, Gutow, Lars, Klages, Michael (Eds.), 2015 Springer, ISBN 978-3-319-16510-3

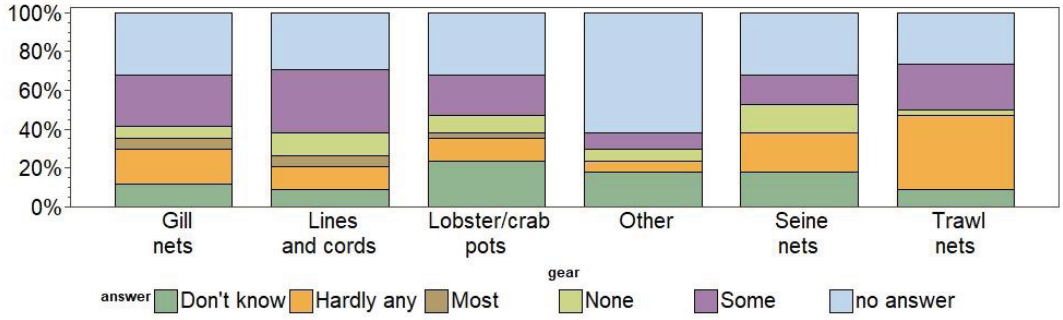
Table 13: Economic benefit of marine litter removal (using impacts from section 1.1.5)

Industry	Harm from marine litter	benefit of removing 1000 tonnes of marine litter or avoiding 1000 tonnes being added through loss/dumping
fishing	Between €60 and €300 million	€250,000 to €1,000,000
ports	€30 million	€100,000
beach tourism	Between €194 and €630 million	€750,000 to €2,500,000
TOTAL		€1,000,000 to €4,000,000

6.3.1.1. Current balance

According to PRODCOM[86] 27,000 tonnes of netting have been sold in the EU in 2016 and studies of floating flitter[87], beach litter[88] and trawls[89] indicates that netting represents significant fraction of plastic material from fishing and aquaculture in the sea; the rest being made up of buoys, pots, feed sacks, gloves, boxes etc. Samples in areas close to shore with high concentrations of aquaculture show significant concentrations of plastic from this source although in other regions this is not the case. For the purposes of this analysis, based on the comparison of available studies we assume an average of 50% is netting. Studies (see annex 7) conclude that best practice currently is in Iceland where 90% of the annual purchase of gear is eventually brought ashore, but over the EU as a whole, the total is only 80%.

Figure 13. Replies by fishermen to question on proportion of gear lost in the open stakeholder consultation



This estimate of gear not brought ashore is a higher proportion than that derived from fishers' reports[90] of lost gillnets[91]. Nevertheless, a significant number of fishers who replied to the open stakeholder consultation as part of this impact assessment reported "some" loss of gear.

[86] "PRODuction COMmunautaire" provides statistics on the production, exports and imports of manufactured goods in the EU

[87] Eriksen et al. 2014 Plastic Pollution in the World's Oceans: More than 5 Trillion Plastic Pieces Weighing over 250,000 Tons Afloat at Sea, PLoS ONE 9(12): e111913

[88] Legambiente, 2016, Beach litter 2016

[89] KIMO, 2015 Fishing For Litter Scotland Final report 2014-2016

[90] Gilman et al, 2016. Abandoned, lost or otherwise discarded gillnets and trammel nets. FAO Technical paper 600

[91] This is a passive fishing technique where vertical panels of netting, normally set in a straight line, trap fish and sometimes considered as making a major contribution to ghost fishing

The main assumption is that 55.000 tonnes of plastic are used by the fishing and aquaculture sector each year. Of this, around a fifth is lost or discarded and enters the seas as marine litter. A number of measures currently underway or planned will contribute to reducing this figure over the next years.

6.3.1.2. European Maritime and Fisheries Fund.

This measure is described for completeness' sake. In its current form it does not reduce marine litter inflow, but only results in taking litter out of the sea. It is also broader in that it targets all forms of fished-up litter, and not fishing gear specifically. A total of €53.07 million has been allocated by EU Member States under Article 40.1(a) of the European Maritime and Fisheries Fund for the "*collection of waste by fishermen from the sea such as the removal of lost fishing gear and marine litter*" in the years 2014-2020. While the operational programmes do not contain a precise enough breakdown, under the previous European Fisheries Fund a split of the budget going to the different activities is available. Assuming the same breakdown and the same efficiency as the operations, we can estimate the environmental impact in terms of litter removed (Table 14). This activity, also known as "fishing for litter", removes litter that is already in the sea ("the stock").

"Investments in facilities for waste and marine litter collection" can also be supported by the European Maritime and Fisheries Fund but as operational programmes bundle this with other activities, it is not possible to identify how much this will amount to[92].

Table 14: Costs of marine litter removal

Action	Proportion	Annual cost to public budget	Plastic removed annually (tonnes)
Collection of lost fishing gear / 'fishing for litter'	46%	€3,500,000	3,500[93]
Litter collectors/bags on board and in port (renting and transport, purchase)	25%	€2,000,000	5,500[94]
Treatment/processing of litter	17%	€1,300,000	n.a.
Awareness raising among fishers	5%	€400,000	n.a.
Research related to marine litter	5%	€400,000	n.a.
Recovering/recycling of plastics	2%	€150,000	n.a.

The reduced environmental impact of 9,000 tonnes per year translates to between €10 million and €35 million in economic benefit for fishing, port and tourism industries (see annex 7). The amounts of plastic removed are estimates based on the operations conducted in Norway.

[92] Fame (2017)

[93] Assuming removal is €1000 per tonne which is based on Norwegian campaigns. Eunomia estimate €818-1275 per tonne. This is probably on the high side for current operations but efficiency can be expected to increase as better reporting of lost gear under the Control Regulations allows more accurate identification of hot spots

[94] Although there is wide variation in performance in different fleets, OSPAR estimate average cost per vessel for "passive" fishing for litter is €500 including organisation and reporting and that each vessel brings back 0.7 tonnes in a year.

These measures are retrieving gear and other plastic lost in previous years and therefore reducing the total mass in the sea *but not the annual inflow*.

6.3.1.3. Fisheries Control

Two measures under consideration for simplifying the Common Fisheries Policy and improving its implementation through the Fisheries Control Regulation will address the issue of entry of fishing gear into the sea.

Table 15. Fisheries control

Measure	Cost to fishermen	Benefit
Use of electronic logbook for reporting lost gear	Negligible marginal cost because introduced at the same time as other modifications to logbook	More accurate reporting and improved effectiveness of recovery operations. Efficiency of these operations varies considerably. A 20% increase in efficiency would add 350 tonnes per year to operations funded under EMFF and a similar amount to the amount recovered in option 3c
Removal of the current derogation applicable to vessels < 12m to carry on board the necessary equipment for the retrieval of lost gear.	€50 million, half the 50,000 vessels in the EU fleet under 12 metres need to spend around €2,000 on winches	Recovery of gear that otherwise would have been abandoned may become possible. There is no information on how much is being retrieved at present (see section 2.2.2).

6.3.1.4. Revision of Port Reception Facilities Directive

The proposed revision of the Port Reception Facilities Directive will turn a number of operations currently financed under the European Maritime and Fisheries Fund into "business as usual".

Table 16. Port Reception facilities

Measure	Cost	Benefit in terms of reduction of annual inflow of fishing gear	Benefit in terms of fishing gear and other plastic lost in previous years
100% indirect fee, so no additional financial cost for bringing waste, including passively fished waste, ashore* * There may be additional costs in the case of smaller, particularly fishing ports which will now need facilities and may need to raise ports fees to pay for them.	-€2,000.000 because the expenditure under OSPAR, KIMO and EMFF schemes to collect, monitor and count litter brought ashore would no longer be necessary or targeted differently.	Equivalent to 2,700 tonnes year (see annex 7)	Equivalent to 2,700 tonnes year (see annex 7)

Measure	Cost	Benefit in terms of reduction of annual inflow of fishing gear	Benefit in terms of fishing gear and other plastic lost in previous years
Member States have to ensure that adequate PRF are available in their fishing ports to deal with this waste in accordance with the waste hierarchy (this includes separate collection of the waste delivered)		Impact assessment for Port Reception Facilities[95] indicates little change in litter brought ashore; although interviews with fishers indicate that current poor facilities may be a disincentive	
Inspection targets for vessels greater than 100 GT and reporting of the advance waste notification made obligatory for fishing vessels longer than 45 metres.		Limited (80% of the EU fishing fleet is below 100GT and/or 45m)	

The reduced environmental impact of approximately 5,500 tonnes per year[96] translates to between €6 million and €20 million in economic benefit for fishing, port and tourism industries. Additional costs such as the possible increase in port fees due to implementation of the PRF Directive are difficult to estimate at this point, but would be borne by the sector in the absence of any additional and/or burden sharing mechanism.

6.3.1.5. Member States Programmes of Measures under the MSFD

Table 17. Member State measures

Measure	Cost	Benefit
Programmes of measures to achieve GES by 2020, including a reduction of lost fishing gear found at sea	Zero. These measures are already included under other options	Better monitoring of marine litter

6.3.1.6. FAO Guidelines

Table 18. FAO Guidelines

Measure	Cost	Benefit
Authorities should introduce or marking of gear, a register of gear by the authorities and sharing of information between authorities	Zero. Implementation would already be covered by the Control Regulation and its proposed revision	Zero over and above what is already being done

[95] SWD/2018/021 final

[96] This includes plastic that does not derive from fishing (see annex 7).

6.3.2. Option 3a – Medium level of impact[97]

6.3.2.1. Extended Producer Responsibility – Basic scheme

This assumes that the producers of plastic material incorporated in fishing and aquaculture gear have responsibility for setting up an organisation to ensure that waste is collected at port, sent to appropriate recycling facilities, incineration plants or landfill sites and reporting.

Table 19. Extended Producer Responsibility- basic

Measure	Costs estimated in study for this impact assessment (annex 7)		Benefit
Gear producers have responsibility for taking back end-of-life fishing and aquaculture gear	€9.7 million	Annual cost for sorting, transport and processing	Specific reduction by this measure: 2600 tonnes per year (see annex 7). This adds to actions already underway/planned[98] Therefore, total cumulative reduction of ALDFG litter (including impact of Port Reception Facilities Directive) 5,500 tonnes per year.
	€6.3 million	Set-up costs	
	€1.3 million	annual administrative costs	

This option would add a maximum of about 4% to the cost of gear, under the unlikely assumption that producers would pass all costs on to users. The extra cost is 0.16% of annual revenue of the EU fishing fleet. The reduced environmental impact of 2,000 tonnes per year translates to between €2 million and €7 million in economic benefit for fishing, port and tourism industries. Note that the cumulative benefit achieved through the combination with other measures listed above would be much higher.

The establishment of an EPR scheme for fishing gear should, in addition, be considered in its interaction with the overall legislative framework. In particular, EPR schemes take over costs for the separate collection and treatment of waste which otherwise fall on the port facility which in turn passes these costs through to ship operators including fishers as part of the indirect fee. The establishment of EPR schemes for fishing gear would therefore reduce ports costs, and correspondingly port fees, related to the treatment of fishing gear. The costs impact would be most notably relevant in small fishing ports which currently have either no, or very small PRFs.

6.3.3. Option 3b – High level of impact

6.3.3.1. Extended Producer Responsibility - with Deposit Return Scheme

This is a scheme whereby a deposit is included in the price of the gear that is being purchases, but is then paid back to the fishermen by weight of fishing gear brought ashore as waste including complete nets, fragments of nets and other plastic fishing gear including buoys, pots etc. Whilst the revised Port Reception Facilities Directive removes disincentives for bringing waste ashore, this would provide a positive incentive to do so.

[97] NB: for all subsequent options, adequate measures need to be taken to ensure full integration with other fee collection schemes, including port fees.

[98] Implementation of PRF, revised CR, EMFF support

This would also be complementary to, and add to the impact of, the strengthened provisions of the revised control regulation, which aim to strengthen marking, retrieval, and reporting of loss. In particular, it would provide an incentive for anglers to return fishing gear waste to shore, leading to higher compliance with both these instruments. Finally, it would ensure adequate disposal, and insertion into the waste stream, of fishing gear waste, adding to the potential of re-use or recycling of the plastic material and potentially reducing overall cost.

Table 14. Extended Producer Responsibility- deposit return

Measure	Cost		Benefit
Fishers refunded for returning end of life or fished up fishing gear material (e.g. with manufacturers directly, via a port collection facility etc.)	The study in annex 7 estimates that that the set-up and administrative costs would be three times that of the simple EPR referenced under 6.3.2.1. The costs below are in addition to those in that option.		Can be assumed to reduce the amount of lost gear to the truly irrecoverable 5%. Reduction of ALDFG inflow into the sea by 2,600 tonnes per year over and above the other measures
	€12 million	set-up costs	
	€2.6 million	administrative costs	

This option would add over 5% to the cost of gear (or 0.2% of revenue). The reduced environmental impact of 2,500 tonnes per year provides between €3 million and €10 million in economic benefit for fishing, port and tourism industries. A successful scheme in Europe could be rolled out elsewhere, thus providing jobs for the service companies running the scheme.

6.3.3.2. Recycling target

Apart from fishing gear in most cases not being pure and clean, other characteristics may make it more challenging to recycle. For example, most fishing nets consist of several separate parts and hence of several types of plastics and material which will not all to the same degree be fit for recycling. In addition, the value of the different types of material can differ rendering for example only the recycling of specific parts economically feasible. Case in point is the Nylon 6/polyamide retrieval from fishnets, which is currently used as base material for i.a. clothing.

Table 15. Recycling target

Measure	Cost	Benefit
Member States have target for recycling	Zero. Once the litter is brought into proper waste management system, the relative costs of landfill, incineration and recycling are similar. Administration costs would already be taken care of in option 1a, the basic EPR system	There would be no direct benefit in terms of reduced litter inflow to the sea. However, adding recycling targets can add incentives for action aimed at increasing the amount of fishing gear brought back to shore.

Nevertheless, this option – in combination with an EPR which could stimulate its development – could provide an additional incentive for producers to undertake measures leading to the collection and reprocessing of returned gear, some of which may generate additional income. It has already and will continue to lead to innovation in the form of

encouraging the production of recycled products made from fishing gear material[99], and provides an incentive and critical mass, which will to reduce the costs of recycling, and may also contribute to reducing the overall costs of an EPR. It also is in line with the overall objectives of the circular economy initiative, which aims at reducing landfill, and incineration and increasing re-use of resources and raw materials.

6.3.4. Option 3c – Maximum level of impact

6.3.4.1. Extended producer Responsibility - with included retrieval operations

Without retrieval actions, the amount of litter from fishing in the sea will continue to increase because, whatever measures are taken to avoid loss of gear, some will always escape. In addition, given the long lifetime of plastic, even a modest annual input of litter will accumulate. In this option we assume that the extended producer responsibility covers the administrative costs of monitoring and the actual recovery by the European Maritime and Fisheries Fund or its successor.

Table 16. Extended Producer Responsibility- with retrieval

Measure	Cost	Benefit
Producer of plastic incorporated in fishing gear has responsibility for supporting retrieval actions	€3 million to set up and 500,000 per year for operations	More effective recovery of lost gear and the possibility of reducing the amount of plastic in the sea.

This option would also generate job opportunities for the handling, cleaning, and dismantling of fishing gear, not to mention its actual recycling. The retrieval of marine litter in general and fishing gear in particular is already being supported financially including through measures under the EMFF. It is therefore realistic to assume that Member States would continue to make use of such funding opportunities in the future based on their specific needs and circumstances (subsidiarity).

This would be even more relevant in case EPRs for fishing gear were imposed through legislation. The compulsory inclusion of retrieval action as part of an EPR therefore is not likely to provides much added value. The decision on whether or not to launch specific retrieval schemes can be left to Member States under the subsidiarity principle.

6.3.4.2. Substitution of plastic products in fisheries and ban

Most fishing gear is composed of different materials, of which plastics are an important component. Choices over which materials to use under which circumstances are usually based on characteristics such as the strength, flexibility, durability, buoyancy, price and past experiences in using certain materials or designs. In this way, fishing gear can consist of a heterogeneous compilation of materials with different characteristics. As such, fishers usually opt for the most cost-effective options. Such choices do however, not always reflect the most environmentally friendly options (such as biodegradability in seawater, recyclability of parts and/or possibility to track lost or abandoned gear).

[99] Some operators currently on the market for recycling fishing gear break even only by importing gear from outside the EU. Viool V. et al. (2018). Study to support impact assessment for options to reduce the level of ALDFG Final report.

So far, we have no knowledge of materials that both meet the operational requirements for fishing gear as well (or better than) those currently used by the sector, and at the same time do not have the potential to cause long-term harm to the environment if lost or abandoned at sea[100]. It is thus not possible to propose such a measure, let alone estimate its cost or impact.

6.3.5. Comparison of Impacts

The annual reduction in marine litter exceeds the current volume entering the sea, reflecting the fact that plastic already in the sea will be removed by the measures put in place.

Table 17. Comparison of impacts for fishing gear – NB – the impacts are cumulative

Measure	Investment cost (€ million)		Annual running cost € million		Annual reduction input to sea from fishing gear (tonnes)	Annual extraction of fishing gear and other plastic from previous years (tonnes)
	Private	Public	Private	Public		
EMFF				7.8		9,000[101]
Control Regulation	50.0				350	
Port Reception Facilities				-2	2,700[102]	2.700
Marine Directive						
Extended Producer Responsibility (EPR)	10.0		1.3		2,600	
EPR with deposit[103]	12.0		2.6		2,600	
Recycling target						
EPR with retrieval[104]	3.0		0.5			
Substitution of material						

[100] There is currently only one convincing example of research being conducted into replacement of material used in certain types of fishing gear with the objective of making this gear more environmentally sustainable [ref Dolly Rope project]. This project is, however, limited in scope and not yet at the stage of allowing conclusions.

[101] This is a aspirational target based on EU countries matching the efficiency of Norwegian operations

[102] This is reduction of inflow

[103] Over and above what is already planned

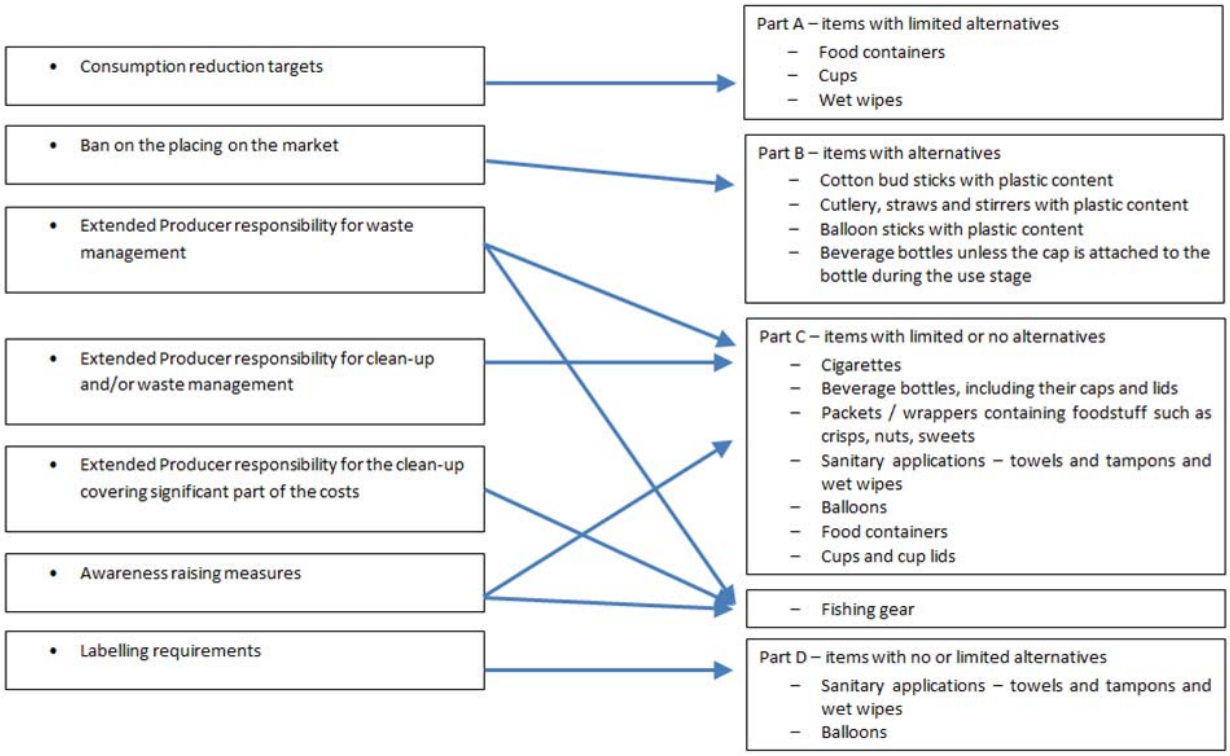
[104] Over and above what is already planned; only administration, costs of operations paid from public budget

7. PREFERRED OPTION

The option with the highest potential to deliver ambitious environmental results, while achieving positive economic impacts, limiting negative effects on employment, ensuring public acceptance, and contributing to wider resource efficiency would be sub-option 2c and sub-option 3a. Whilst estimates of marine litter volumes need to be treated with caution, the preferred measures could **significantly reduce marine litter from single use plastics and fishing gear**. These are the main sources of plastic marine litter in Europe, accounting for 84 per cent of European plastics entering the marine environment by count, which is the best indicator of the environmental, social and economic impacts. The measures on fishing gear will also lead to the removal of some plastics already in the seas.

The option includes additional measures for SUP and fishing gear and fills gaps in EU level action including legislation that are only partially closed by recent efforts such as the revision of the Port Reception Facilities Directive, the revised waste legislation, the Plastic Bags Directive, and measures in the Plastics Strategy. Figure 13 shows the preferred option grouped by different items.

Figure 14. Preferred choice (2c and 3a)



7.1. Recommended option for SUP

The recommended option would reduce SUP marine litter by half and includes:

- bans on the placing on the market of single use plastic versions of cotton bud sticks, balloon sticks, cutlery, straws and stirrers;

- reduction targets for single use plastic versions of drinks cups and lids, wet wipes, and food containers: 30% by 2025 and 50% by 2030;
- Extended Producer Responsibility schemes to contribute to the cost of prevention, waste management, including clean-up of litter for the items that are not packaging such as cigarette filters, sanitary applications including wet wipes, drinks cups and lids, food containers, balloons.
- for those items that are considered to be packaging, as defined under the Packaging Directive, the existing Extended Producer Responsibility will be extended to cover the clean-up cost.
- labelling requirements for sanitary towels, wet wipes and balloons; and
- product design measures for drink bottles related to tethered caps.

Setting EU-wide targets for different SUP would 'guide' measures to be adopted by Member States, ensuring that they are ambitious enough to achieve the desired effect. The costs to implement these targets will ultimately depend on the choice and design of the measures adopted at national level. Section 5 highlighted a wide range of complementary measures that can be used in a targeted way. In particular:

- There is continuing successful experience with the use of behavioural 'nudge' policies that could be used to shift consumer behaviour, and lead to efficient reductions. Analysis of behavioural economics suggests that consumers face scarcity of time and attention, and already receive too much labelling and information. Instead, it suggests that a more bottom-up approach would be working more actively with different actors (this would indirectly translate into natural awareness-raising initiatives through social networks and the press). Indeed, behavioural insights suggest that social norms and myopia – among other behavioural biases – apply in this context. Bottom-up campaigns – by making visible the environmentally friendly behaviour of the progressive group - would be more appropriate to activate virtuous behaviour via social norms.
- Businesses (both producers and retailers) are showing a willingness to pledge voluntary action. The preferred option will send a clear policy signal and reward early action.

This combination of measures relating to each type of single use plastic item reflects the messages from the public consultation, stakeholder workshops and the conference. It is coherent with the view in the public consultation that legislative requirements to better design or to produce with materials with low life cycle impact are generally the most effective approach, followed by reduction targets. It strikes a balance between measures, recognising the effectiveness of reduction targets for drinks cups and food containers, and EPR schemes for several types of items.

7.2. Recommended option for fishing gear

The recommended option for fishing and aquaculture gear is the introduction of an Extended Producer Responsibility for producers of fishing gear containing plastic.

This option has overall the highest potential impact on the reduction of the ALDFG contribution to marine litter. It builds on, complements and facilitates full implementation of action under option 1. It would underpin and facilitate full implementation of other instruments. In particular, it adds the specific support of a producer-financed dedicated

mechanism targeting the collection and treatment of waste fishing gear as an additional incentive for the return and collection of waste fishing gear to port, which is already the object of both the Control Regulation and the revised Port Reception Facilities Directive. It can notably contribute to easing cost burdens for small scale ports and/or fishing operators by ensuring that some or all of the costs linked to increased collection and treatment of litter from fishing gear in ports, and treatment beyond the framework of the PRF Directive, is taken over by the producers of fishing gear.

This type of positive incentive was seen by the majority of stakeholders as the most effective means of reducing the loss of gear into the sea.

Setting up an extended producer responsibility scheme for fishing gear containing plastic implies a cost which, if it were passed on to the fishing sector, would be marginal with regard to its overall turnover (≈0.16%). Experience shows that in competitive markets (for fishing gear materials, 60% of the material is imported) producers tend to absorb all or part of the EPR scheme's costs. It is therefore unlikely that the full cost of the EPR scheme would be passed on to fishing operators. In addition, current provisions under EU funding instruments, notably the EMFF, also allow Member States to finance actions leading to the reduction of the accumulation of lost fishing gear in the marine environment. This type of financial support, if taken in addition to the EPR would allow to offset initial costs of the above EPR scheme, both for producers, for local administrations, and for fishers.

In sum therefore, a genuine reduction in costs for fishers as compared to the baseline scenario should be expected. Finally, and in line with the Plastics Strategy's objective of integrating and completing EU action on plastics and marine litter, the EPR would be integrated as appropriate with the management of port reception facilities, including by contributing to its costs.

Option 1, which consists of the full implementation of existing measures and proposal already on the table, will lead to progress in reducing the amount of fishing gear litter ending up in the sea.

- In particular and as noted before, the revised Port Reception Facilities Directive would reduce disincentives for fishers to bring gear and other litter back to port. As stated explicitly by the Commission in its proposal for a revision of the Port Reception Facilities Directive, additional measures for reducing lost or abandoned fishing gear, were still being examined from the outset, such as Extended Producer Responsibility[105]. Such additional measures can ensure the treatment of plastic components of fishing gear in a dedicated waste management cycle, including the potential re-use or recycling, with the advantages set out above. Without this next step however, the envisaged encouragement of fishers to return gear to shore under the measures set out under the PRF Directive may not yield maximum returns, because in a number of cases notably affecting the small scale fishing sector and smaller ports, the increased port fees may have an impact on the fishers.

[105] Explanatory Memorandum of PRF Directive, section 1

Option 3b, which consists of strengthening even further the proposal for an EPR by adding a deposit scheme and a recycling target would further enhance the level of return of gear. It is however more costly to implement potentially increasing costs for the sector whilst also increasing administrative burden. In addition, in the case of fishing gear, and as opposed to land-based plastic material, the risk of losing the deposit is relatively high, potentially diminishing its impact as an incentive.

Setting a recycling target would on balance create complexities in defining such a target, administrative burden and costs of its monitoring would be considered disproportionate – in particular where setting up an EPR scheme in itself is already likely to stimulate the development of the current small market for the recycling of fishing gear materials.

Option 3c includes the obligation to fund a compulsory retrieval scheme for fishing gear under the EPR, is considered to be:

- Disproportionate, in that it makes compulsory to finance a measure which is based on voluntary participation and is currently being supported by i.a. EU financial instruments, support which will in all likelihood continue and be strengthened in the future.
- Potentially duplicative, to the extent that gear retrieval is included as an obligation in the proposal for a revision of the Control Regulation under the Common Fisheries Policy

7.3. Nature of the instrument

The decision to favour a **dedicated legislative instrument** (lex specialis) was motivated by:

- some existing legal instruments are general in their objectives, and their measures to tackle marine litter do not specifically target products so this would go beyond their original scope;
- other instruments are too narrow in their scope to address the identified ten SUPs, such as in the case of the Packaging directive that regulates only packaging (but even then has specific targeted measures only for one SUP item, namely plastic bags);
- fishing gear is already subject to a regulatory regime spread across different EU policies - fisheries, transport (PRF) and environmental policies (e.g. WFD, MFSD). None of the existing legal acts could reflect the wide variety of measures foreseen in the new instrument to effectively target the marine problem upstream.
- a dedicated legal instrument to address a specific waste stream (i.e. a sub-group of plastic waste) or environmental risks of a specific activity (e.g. the landfill directive that addresses one of many disposal operations - the landfilling of waste) is common in the waste legal regulatory framework (e.g. directives on batteries, packaging).

The possibility of amending existing legislation was considered. In view of the wide variety of measures in the preferred option, it would require the amendment of several existing legal instruments, such as the Marine Strategy Framework Directive, the Packaging and Packaging Waste Directive, the Waste Framework Directive, the proposed Port Reception Facilities Directive, or the Fisheries Control Regulation. The approach to amend multiple legal acts would lead to further fragmentation of the legal framework and bring more confusion and complexity for the Member States, economic operators and consumers in terms of transposition and implementation.

With regard to the nature of the legal act, a Directive is the appropriate legal instrument for the attainment of the envisaged objectives and measures. It allows:

- the definition of harmonised and clear objectives (e.g. binding consumption reduction targets) and measures (bans and product requirements for placing on the market, extended producer responsibility that harmonises the level of financial responsibility of producers for prevention and waste management objectives) that will ensure a level playing field across the Member States in terms of scope and ambition of action;
- Member States - for some but not all measures - to choose the most appropriate legal, administrative and economic instruments to implement them. This is in line with the subsidiarity principle. Existing legal acts concerning other waste streams but containing similar measures (awareness raising campaigns, consumption reduction targets and extended produce responsibility schemes) also envisage same level of flexibility to Member States to choose the appropriate instruments. More prescriptive instruments to implement the goals and measures would be difficult to justify based on the principle of subsidiarity. The measures targeting products that have alternatives or that justify stricter intervention measures – i.e. marketing restrictions and product and labelling requirements – would leave no room for adapted Member States measures.

Bans on placing on the market, product requirements and labelling requirements are compatible with a Directive and many existing EU waste directives contain such measures. They can be clearly defined to avoid any divergence in their implementation (e.g. by setting clear entry-into-force rules, harmonised labelling rules). On the other hand, a regulation – by the fact that it is addressed to economic operators and should be implementable without specific Member State transposition measures – is incompatible with the measures envisaged in the preferred option, namely consumption reduction targets, EPR and awareness raising campaigns, because they require the adoption of national and even local transposition and implementation measures to complement already existing regulatory regimes.

8. MONITORING AND EVALUATION

8.1. Monitoring and evaluation arrangements

The **main indicator** for progress towards meeting the objectives set for this policy initiative will be the beach counts of litter. Member States shall use the methodology developed by the MSFD Technical Group, and as set out in JRC Technical Reports. A revised Commission Decision was adopted in April 2017 establishing criteria and methodological standards for the determination of Good Environmental Status (GES) for marine litter. This Commission Decision requires that litter shall be monitored in the coastline in all cases and may additionally be monitored on the sea surface and the seabed.

At the same time, threshold values are to be established at Union or other levels (regional/sub-regional) for quantities of litter on beaches/water column/seafloor, for litter ingested by marine animals and for adverse effects (entanglement, other types of injury or mortality or health effects, of the species concerned due to litter). These values will be set through a collaborative and inclusive process and will facilitate evaluating effectiveness of measures against specific sources of marine litter.

Work on baselines and thresholds started in 2017. It is not feasible to finalise it and have it reflected in the next reports (expected in October 2018) from Member States (under the MSFD Directive). However, it will be used for the next round of monitoring programmes (2020) and inform the updated programmes of measures (2022) against marine litter.

Monitoring will also be required with regard to measures to reduce the consumption of SUP. The measurement methodology will be established in the waste committee established under EU waste legislation. Where possible it should take advantage of existing EU production and trade databases (PRODCOM[106] and COMEXT[107]) managed by Eurostat and regularly updated with information provided by Member States. Synergies should also be used with regard to existing reporting mechanisms, in particular, for the measurement and reporting of consumption reduction of plastic bags under the Plastic Bags Directive.

In line with the principle of subsidiarity, the exact data collection methods will depend on the internal organisation of each Member State and the nature of the implementing instruments chosen, where there is flexibility.

In addition, in accordance with the Waste Framework Directive (as it will be amended in 2018), Member States are obliged to reflect their waste prevention measures in their Waste Prevention Programmes, including measures to monitor and assess their implementation.

With regard to fishing gear, the implementation of the revised Control Regulation will improve the capacity for monitoring and analysing the extent to which fishing gear is returned or lost at sea. In line with the existing legislation, Members States take measures to accurately identify, quantify and track the number of fishing gear being deployed, monitored, set upon and recovered, including via satellite technology; and unique identifiers for fishing gear would allow for tracking and deriving estimates on effort levels. Over and above this, in accordance with the minimum requirements for Extended Producer Responsibility schemes established in the Waste Framework Directive, the producers of fishing gear would be expected to monitor fishing gear placed on the market and waste fishing gear deposited in appropriate port reception facilities and the subsequent waste treatment.

In line with the Interinstitutional Agreement between the European Parliament, the Council of the European Union and the European Commission on Better Law-Making Better Regulation, an evaluation of the legal instrument will be envisaged to assess how the implementation of the legislation.

8.2. Operational objectives

The **operational objectives** of the initiative are to:

- remove single use plastic versions of cotton bud sticks, balloon sticks, cutlery, straws and stirrers from the market;

[106] Survey for the collection and dissemination of statistics on the production of industrial (mainly manufactured) goods, both in value and quantity terms, with at least an annual frequency, in the EU.
[107] Eurostat reference database for EU external trade, including imports and exports.

- reduce single use plastic versions of drinks cups and lids, wet wipes, and food containers: 30% by 2025 and 50% by 2030;
- reduce marine litter from single use plastic versions of cigarette filters, drinks bottles, crisp packets and sweet wrappers, wet wipes, sanitary applications including wet wipes, drinks cups and lids, food containers, balloons;
- Encourage and facilitate the retrieval of lost fishing gear, in particular by improving the availability and reliability of information on its location and compliance with legal obligations regarding this reporting and retrieval; and
- Maximise the entry of end-of-life gear from the fisheries and aquaculture sector, including retrieved ALDFG, into an efficient waste management regime by setting up adequate incentives, schemes and infrastructures to collect, sort, dismantle, transport and recycle used plastic materials in a cost-effective way.

EUROPEAN
COMMISSION

Brussels, 28.5.2018
SWD(2018) 254 final

PART 2/3

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT

Reducing Marine Litter: action on single use plastics and fishing gear

Accompanying the document

Proposal for a Directive of the European Parliament and of the Council on the reduction of the impact of certain plastic products on the environment

{COM(2018) 340 final} - {SEC(2018) 253 final} - {SWD(2018) 255 final} -
{SWD(2018) 256 final} - {SWD(2018) 257 final}

ANNEX 1: PROCEDURAL INFORMATION

Lead DG: Directorate Generals Environment (ENV) and Maritime Affairs and Fisheries (MARE)

Agenda Planning Reference AP N°	Short title	Foreseen adoption
PLAN/2017/2170	Reducing marine litter: action on single-use plastics and fishing gear	Spring 2018 (Commission Proposal)

1 ORGANISATION AND TIMING

Work has been ongoing for a number of years on marine litter, reflected for example in the in the 'Marine Strategy Framework Directive' (MSFD) adopted in 2008 with the aim to achieve 'Good Environmental Status' (GES) for the European seas[1] by 2020 ' or the 'aspirational marine litter reduction target 30% by 2030 with 2015 baseline' set out in the Circular Economy Package.

On 15 December 2017, the Inception Impact assessment Roadmap "Reducing marine litter: action on single-use plastics and fishing gear" was published. At its closure, on 12 January, 28 reactions were received, which are being analysed now. ENV leads the work on single-use plastics (SUP), MARE on fishing gear, in close collaboration with each other.

The Inter Service Steering Group (ISSG) for the Impact Assessment was set up by the SG in January 2018 and includes the following additional DGs and Services: SJ, GROW, TRADE, ENER, JUST, EMPL, MOVE, SANTE, CNECT, ECFIN, TAXUD, RTD, AGRI, EAC, REGIO, CLIMA, COMP.

Meetings were organised between January 2018 and May 2018. Further consultations with the ISSG were carried out by e-mail.

The ISSG discussed the Inception Impact Assessment and the main milestones in the process, in particular the consultation strategy and main stakeholder consultation activities, key deliverables from the support study, and the draft Impact Assessment report before the submission to the Regulatory Scrutiny Board.

2 CONSULTATION OF THE REGULATORY SCRUTINY BOARD

The Regulatory Scrutiny Board ("RSB") received the draft version of the present Impact Assessment report on 5 March 2018. The RSB had previously given some indications of what was required through an upstream support meeting. Further to the meeting with the RSB on 21 March 2018, the RSB gave a negative opinion on 23 March 2018. The opinion included

[1] GES is assessed against 11 descriptors, one of the descriptor relates to marine litter levels.

recommendations, which have been addressed in the revised IA report as explained in the table below and were discussed in an Inter Service Steering Group meeting.

Comments from the Regulatory Scrutiny Board

Main considerations	*Further considerations*	*How these issues have been addressed in the IA Report*
1. The report does not state clearly whether focussing on 10 single use plastic items and fishing gear is meant to reduce significantly marine litter or to address its most hazardous part. It does not demonstrate how newly emerging problematic plastic items would be addressed.	what problem the initiative wants to tackle: the mass of marine litter in the ocean, or the number of plastic items on the beach or in the ocean.. The report should. The report should in the main report and the annexes.	Section 1 has been redrafted to explain this is a complementary initiative to other efforts (to circular economy and microplastics initiatives). It targets the main sources of macro plastics. This is further elaborated in redrafting throughout Section 2.1, where discussion of the Top 10 SUP has been included and explained for the first time. Section 2.1.2 addresses weights or counts issue directly
	demonstrate and motivate why the scope of the initiative has to be limited to the top 10 single use plastic items and lost or abandoned fishing gear	Section 1 and 2 redrafted to explain the focus on macroplastics and not microplastics. Section 2 explains better how the initiative addresses 84% of plastic marine litter by count Section 5.1 further elaborates.
	demonstrate the relevance of the list of 10 items and that it is future proof, in particular in comparison to national and international initiatives	Section 2.1 redrafted to make clear that the Top 10 covers 86% of SUP, and so is a wide list for now. The additional items are explained in more detail in Annex 3. Section 8 better explains how changes in the occurrence of plastic items on beaches and in the seas could be dealt with in the future.
	check the consistency and qualify the robustness of the various figures on marine litter and plastic marine litter	Text has been clarified throughout Section 2 (and Annex 3) and new headline figures added to make relevance clearer
	The analysis of impacts and comparison of options should reflect the revised problem analysis	Section 6 redrafted to better link with section 2
2. The report does not analyse shortcomings of existing environmental, fisheries and maritime legislation in preventing the named items from ending up in the sea	Analysis of why existing legislation does not succeed to prevent the identified items from becoming marine litter.	Section 2.4 redrafted to clarify why this is not an enforcement issue. Detailed clarifications and gaps of the current legislation are included in Section 5.2.1.
	consider measures to improve implementation instead of introducing an additional layer of legislation	The issue of better implementation is discussed in Section 2.4 and 5.2.1
3. The report does not argue convincingly that this is a cross-border	the facts that the Commission has an abundance of data and that Member States have decided (not)	Sections 3 and 4 redrafted to make clearer that this is a transboundary issue, make clearer the secondary / additional arguments

Main considerations	*Further considerations*	*How these issues have been addressed in the IA Report*
problem that is best addressed at EU-level. It also does not consider the role and impact of existing legislation, especially for fishing gear	to take different measures resulting in a patchwork approach are insufficient evidence that EU-level legislation is justified	on subsidiairity and the link to existing legislation
4. The construction, the description and the comparison of the options does not make clear that the final package combines the most cost-effective solutions for the different product	How the proposed actions address the problem drivers and complement existing legislation.	Section 5.2.3 redrafted to better explain how the sub-options address the drivers and pathways and complement existing legislation
	Explain the logic behind the grouping of measures for each plastic item into the different option packages. This makes it difficult to understand the effectiveness of the individual measures and packages, so that the choice for the preferred options is not sufficiently substantiated.	Section 5.2.3 now explains the grouping and that the underlying analysis per measure is found in Annex 6. Section 6.2 includes further analysis of the different sub-options, their make-up and the trade-offs and comparison between them.
	The options for fishing gear need to be complemented and developed from types of measures into well-defined interventions. The report also needs to discuss how this initiative would tackle marine litter in the long-term.	
	describe the numerical models and assumptions used for the analysis	Section 6 includes additional information on the underlying assumptions and further information is added into the underpinning Annexes
5. The report misses the views of the stakeholders throughout the document	discussion should illustrate whether the preferred option varies among stakeholders and which mitigation measures are being considered to address stakeholder concerns	Stakeholder discussion included where relevant in main text and in particular in Section 5

The RSB gave consequently a positive opinion with reservations on 16 April 2018. The recommendations included in this opinion have been addressed in the revised IA report as explained in the table below.

Comments from the Regulatory Scrutiny Board

Main considerations	*Further considerations*	*How these issues have been addressed in the IA Report*
(1) The revised report still fails to make a compelling case for additional measures on fishing gear, beyond the recent revisions of legislations.	For fishing gear, it remains problematic that this initiative intends to add new layers of legislation, while parts of the existing or proposed legislation appear to have already addressed the issue. The revised report states that the main shortcoming of the existing legislation is the insufficient incentives for fishermen to bring back their gear to shore. However, the legislation in the pipeline not only makes it illegal to dump garbage into the ocean, it requires the mandatory marking of fishing gear, its retrieval in the event of loss, the notification of the loss in case retrieval is not possible, and the inclusion of this information in the electronic reporting obligations. Furthermore, the proposal for the revision of the Port Reception Facilities Directive introduces clear incentives for delivery of waste. It foresees the removal of financial disincentives to return waste to the port and has increased reporting and inspection obligations for fishing vessels. This proposal also foresees that a reduced waste fee would be applied for ships that can demonstrate sustainable and environmentally sound waste management on board. Finally, the European Maritime and Fisheries Fund can also provide financial support for the recovery of lost gear and for the waste handling on ships. In the current state, the report does not make the case for actions on fishing gears and proposes initiatives which are unnecessary and burdensome.	Section 2.2.2 "underlying drivers" and section 2.4 "current policy framework" and section 6.3.1.4 "Revision of Port Reception Facilities Directive" point out that whilst individual fishermen will not be penalised for bringing waste ashore, port fees will increase if more waste is brought ashore and waste handling facilities need to be upgraded, especially in the small fishing ports that many vessels use. The text has also been modified to strengthen the argument concerning economies of scale if the sorting, transport and disposal of waste is carried out at a regional or national scale.
	A number of options address recycling of macro plastics, which does not directly tackle the main	This comment related to fishing gear. The report already indicates that there are no direct benefits in terms of litter

Main considerations	*Further considerations*	*How these issues have been addressed in the IA Report*
	problem of plastics in the seas. While recycling improves the use of natural resources, it does not in itself reduce littering or increase the percentage of waste returned to ports. The report should re-assess the appropriateness of including such options.	input in the sea. Nevertheless the setting of targets was identified as an essential component of the successful Icelandic system that helped the fishermen develop ownership of the scheme Furthermore, since monitoring the final destiny of waste is an integral part of the EPR option, the marginal cost is almost zero.
(2) Although the report makes it clearer that the 10 most frequently found single-use plastics are harmful as a group, this is not shown for each individual item, especially for those that are least frequently found.	The report discusses the harmful effects of the 10 most frequently found single-use plastics as a group, while it foresees measures for each of the items individually. It should therefore show that each of these items is sufficiently harmful to warrant the proposed measures. This is particularly relevant for those items that are found less frequently, as they represent only a small proportion of the macro plastics in the seas.	Section 2.1.4.2 has been redrafted to state that, there is some evidence (although with little scientific literature available yet) that differentiates the impacts of the different items. The global impact is however high and the chosen option (2c) would, according to the modelling referred in table 27 of Annex 6 (and based on the underlying assumptions), reduce 464 million items in marine litter, compared to the baseline scenario. Even for the smallest group in relation to littered items, cutlery, this option would reduce the inflow into the marine environment with 18 million items.
3) The report does not analyse why it is better to introduce new legislation for single-use plastics. It does not explain why improving implementation of existing legislation, in particular on waste management is not the way forward.	For single-use plastics, the analysis of the current policy framework (section 2.4) should clarify to what extent plastics end up in the oceans as a result of a lack of ambition of current legislation or because of weak implementation. It should also demonstrate that introducing measures to reduce the occurrence of each of the 10 most found single-use plastics is more effective and/or efficient than strengthening the existing legislation or its implementation.	Section 2.4. has been redrafted to reinforce the fact that the waste legislation will have effects mainly on increasing recycling by using plastics that are now either incinerated, landfilled or exported, with marginal impact on littering. Upstream measures are also more efficient.
	The case for taking action at EU-level on marine litter has been reinforced in the revised report. However, some of the arguments could be further strengthened. Besides cross-border protection of the environment, the revised report cites market fragmentation as the legitimation to introduce Europe-	Section 4.2 has been redrafted to reinforce that some MS are already taking action on acting and others are planning to do so in line with new scientific findings and public pressure. The diverse regulatory approaches will increase the risk of uneven ambition and different rules for economic operators with consequent negative impact on the

Main considerations	*Further considerations*	*How these issues have been addressed in the IA Report*
	wide measures. However, it does not prove that fragmentation indeed poses a problem either for the market or for addressing marine litter.	market.
	The revised report has clarified the use of statistics on plastics in the seas. However, there remain inconsistencies in the data that are not highlighted in the presentation. In particular, different parts of the report state that single-use plastics represent half of all items (plastics and non-plastics) on the beach, but also that they represent half of the count of plastic items, which cannot both be correct. More generally, the report should avoid imprecise and/or unfounded assumptions and statements. Additionally, the report should explicitly mention the large uncertainties of the modelling and its assumptions regarding the effectiveness of the proposed measures.	We agree: SUP represent about 50% of all marine litter in counts. As plastics is around 85% of all marine litter, this means the SUP represent about 60% of all *plastic* marine litter. The text was changed to clarify this difference. The text was also improved in general, and uncertainties of the modelling be added.

3 EVIDENCE USED IN THE IMPACT ASSESSMENT

The IA report and the options considered in the IA report were developed based on the following documents, sources and evidence:

- **Main studies**

  The Commission sought external expertise through a contract for a support study with Eunomia (for SUP) and Deloitte (for fishing gear). From the deliverables of these contracts, the IA report used in particular the analysis and modelling of the different policy options. In addition, JRC Technical Reports provide a significant underpinning:

  - Cambridge Econometrics and Denkstatt "Links between production and the environment", ongoing
  - ICF and Eunomia "Plastics, reuserecycling and marine litter", ongoing
  - Deloitte "Study to support impact assessment for options to reduce the level and detrimental impact of plastic from fishing gear", ongoing
  - Joint Research Centre (JRC), Anna Maria Addamo, Perrine Laroche, Georg Hanke, JRC Technical Reports, "Top Marine Beach Litter Items in Europe", 2017
  - Joint Research Centre (JRC), Georg Hanke, JRC Technical Reports, "Marine Beach Litter in Europe – Top Items", 2016

- Joint Research Centre (JRC), Joana Mira Veiga, David Fleet, Susan Kinsey et al., JRC Technical Reports, "Identifying Source of Marine Litter", 2016
- Joint Research Centre (JRC), Stephanie Werner, Ania Budziak, Jan van Franeker et al., JRC Technical Reports, "Harm caused by Marine Litter", 2016
- Joint Research Centre (JRC), Daniel González, Georg Hanke, Gijsbert Tweehuysen et al., JRC Technical Reports, "Riverine Litter Monitoring – Options and Recommendations", 2016
- Joint Research Centre (JRC), MSFD Technical Subgroup on Marine Litter, JRC Scientific and Policy Reports, "Guidance on Monitoring of Marine Litter in European Seas", 2013

- **Additional external expertise (non-exhaustive list)**
  - Target review project, DG ENV support contract for the preparation of the impact assessment, Eunomia with Argus, Öko Institute and Copenhagen Resource Institute and Satsuma Media, final report in approbation process, http://www.wastetargetsreview.eu/
  - Past and future climate benefits from better municipal waste management in Europe, EEA 2011, http://www.eea.europa.eu/publications/waste-opportunities-84-past-and
  - Technological, Socio-Economic and Cost-Benefit Assessments Related to the Implementation and Further Development of EU Waste Legislation, Eunomia with Argus, Öko Institute and Copenhagen Resource Institute and Satsuma Media, final report in approbation process, http://www.wastemodel.eu/
  - Use of economic instruments and waste management performances, Bio Intelligence Service with IEEP, Eunomia, Ecologic, Arcadis and Umweltbundesamt, April 2012, http://ec.europa.eu/environment/waste/pdf/final_report_10042012.pdf
  - Application of the 'producer responsibility' principle in the context of waste management, Bio Intelligence Service with IEEP, Eunomia, Ecologic, Arcadis and Umweltbundesamt, December 2013, http://epr.eu-smr.eu/
  - Support to Member States in improving waste management based on assessment of Member States' performances, Final report, May 2013, BiPro with Arcadis and Enviroplan, http://ec.europa.eu/environment/waste/framework/support_implementation.htm
  - Managing municipal solid waste – a review of achievements in 32 European countries, EEA report N° 2/2013, EEA 2013, http://www.eea.europa.eu/publications/managing-municipal-solid-waste
  - Treating waste as a Resource for the EU Industry. Analysis of Various Waste Streams and the Competitiveness of their Client Industries - Final report, ECSIP Consortium for the European Commission, DG ENTR, August 2013
  - Study of the largest loopholes within the flow of packaging material, Bipro Final Report (ENV.D.2/ETU/2011/0043)
  - Implementing EU Waste Legislation for Green Growth – Final report, Bio Intelligence Service for the European Commission DG ENV, November 2011 http://ec.europa.eu/environment/waste/studies/pdf/study%2012%20FINAL%20REPORT.pdf
  - EEA report 8/2011, "Earnings, jobs and innovation – the role of recycling in a green economy", EEA 2011

- Resource saving and CO2 reduction potentials in waste management in Europe and the possible contribution to the 2020 CO2 reduction target in 2020, PROGNOS and IFEU, October 2008 http://www.prognos.com/CO2-study.609.0.html
- Is structural measures funding for municipal waste management infrastructure projects effective in helping Member States achieve EU waste policy objectives? European Court Auditor special report N° 20, 2012 http://www.eca.europa.eu/
- Municipal Solid Waste Management Capacities in Europe (Draft), EEA-ETC/SCP, January 2014
- Investment potential for the treatment of bio and recyclable municipal waste in the EU, final report, EIB with the support of Prognos and Lameyer KW consult, November 2013
- How to improve EU legislation to tackle marine litter, IEEP for Seas at Risk, July 2013
- Diverting waste from landfill - Effectiveness of waste-management policies in the European Union. EEA Report No 7/2009, http://www.eea.europa.eu/publications/diverting-waste-from-landfill-effectiveness-of-waste-management-policies-in-the-european-union
- Danish Government (2013) Denmark Without Waste: Recycle More - Incinerate Less, November 2013, http://www.mst.dk/NR/rdonlyres/EBE9E5D4-B765-4D4E-9954-9B713846E4CF/162130/Ressourcestrategi_UK_web.pdf
- Jakus P. M., et al. (1996) Generation of Recyclables by Rural Households, Journal of Agricultural and Resource Economics, Vol 21 (1), pp 96-108; and Tiller K. H., et al. (1997) Household Willingness to Pay for Dropoff Recycling, Journal of Agricultural and Resource Economics, Vol 22 (2), pp 310-320). A. Bruvoll, B. Halvorsen and K. Nyborg (2002), Households' Recycling Efforts, Resources, Conservation and Recycling, 36: 337-354
- Bipro Final Report (ENV.D.2/ETU/2011/0043): Study of the largest loopholes within the flow of packaging material, p. 22
- Analysis of the key contribution to resource efficiency, BIO Intelligence Service for DG ENV, April 2012
- EIMPack (2011) *Economic Impact of the Packaging and Packaging Waste Directive – literature review*, http://eimpack.ist.utl.pt/docs/Literature%20Review_final.pdf.

4 LIST OF ACRONYMS, ABBREVIATIONS AND GLOSSARY

- **ALDFG –** Abandoned lost and otherwise discarded fishung gear
- **BAU –** Business as usual
- **BAT –** Best Available Technique
- **BEP –** Best Environmental Practice
- **C&D waste** – Construction and demolition waste, which includes concrete, bricks, gypsum, wood, glass, metals, plastic, solvents, asbestos and excavated soil arising from activities such as the construction of buildings and civil infrastructure, total or partial demolition of buildings and civil infrastructure, road planning and maintenance

- **CFP –** Common Fisheries Policy
- **CR –** Control Regulation
- **CIR –** Control Implementing Regulation
- **EEA -** The European Environment Agency
- **ETC/SCP -** European Topic Centre on Sustainable Consumption and Production
- **EMFF –** European Maritime and Fisheries Fund. One of the five structural and investment funds of the funding period 2014-2020. Successor to the European Fisheries Fund (EFF).
- **Energy recovery** – The use of waste as fuel or other means to generate energy. Directive 2008/98/EC introduced specific new criteria to determine the efficiency level at which incineration in municipal waste incinerators can be deemed an energy recovery rather than disposal activity
- **EPR -** Extended Producer Responsibility – these systems makes those placing goods on the market – producers, importers - responsible for the waste collection and treatment of the waste generated
- **FADs –** Fish Aggregating Devices, used especially in tuna fishing in uinternational waters
- **GDP -** Gross Domestic Product
- **IA -** Impact Assessment
- **IASG -** Impact Assessment Steering Group
- **Industrial waste** – Industrial waste is waste generated in industrial and manufacturing processes such as basic metals, food, beverage and tobacco products, wood and wood products and paper and paper products
- **LCA** – Life cycle assessment (or analysis) – the investigation and evaluation of the environmental impacts of a given product or service caused or necessitated by its existence
- **MBT –** Mechanical Biological Treatment facilities – facilities combining different mechanical and biological treatment usually aiming at treating residual waste (after separate collection)
- **MS** – Member State
- **MSW –** Municipal solid waste – Article 2 of Directive 1999/31/EC defines municipal waste as waste from households, as well as other waste which, because of its nature or composition, is similar to waste from households
- **MSFD** – Marine Strategy Framework Directive (2008/56/EC)
- **NPP –** National prevention programmes – Article 29 of the WFD requires MS to prepare waste prevention programmes by end 2013
- **Preparing for re-use** – Article 3 of Directive 2008/98/EC defines preparing for re-use as 'checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing'

- **PAYT** – 'Pay as you throw' systems. These systems also called variable rate pricing are systems in which residents are charged according to the waste they actually produced. There are different ways of metering the waste produced either sophisticated systems where waste is weighted or more simple systems where a tax is applied per waste bag according to its volume
- **PPWD –** Packaging and Packaging Waste Directive
- **PRO** – Producer Responsibility Organisation – collective organisation aiming at ensuring that the obligations of financing/meeting waste management targets (reuse/recycling) laying on producers/importers when they place goods on the EU market are fulfilled
- **Recovery** – Article 3 of Directive 2008/98/EC defines recovery as 'any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy'
- **Recycling** – Article 3 of Directive 2008/98/EC defines recycling as 'any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations'. There are some differences in the definition of the concepts of 'recycling', 'recovery', 'reuse' and municipal waste between the WFD, the Landfill and the PPWD
- **Re-use** – Article 3 of Directive 2008/98/EC defines re-use as 'any operation by which products or components that are not waste are used again for the same purpose for which they were conceived'
- **Waste Hierarchy** – Article 4 of Directive 2008/98/EC makes the waste hierarchy a 'priority order' in waste prevention and management legislation and policy, and defines it as, in order of preference: (a) prevention; (b) preparing for re-use; (c) recycling; (d) other recovery, e.g. energy recovery; and (e) disposal
- **Waste prevention** – Article 4 of Directive 2008/98/EC defines prevention as 'measures taken before a substance, material or product has become waste, that reduce: (a) the quantity of waste, including through the re-use of products or the extension of the life span of products; (b) the adverse impacts of the generated waste on the environment and human health; or (c) the content of harmful substances in materials and products'
- **WFD** – Waste Framework Directive originally adopted in 1975 and revised in 2008 as Directive 2008/98/EC

ANNEX 2: STAKEHOLDER CONSULTATION – SYNOPSIS REPORT

1 INTRODUCTION

The consultation objectives were to gather views, concerns and ideas from a wide variety of interested stakeholders on the best means to achieve a reduction in marine litter, particularly originating from Single-Use Plastics (SUPs) and from fishing gear. The results of the consultation activities described in this document have fed into the Commission's Plastics Strategy[2] and the Impact Assessment on SUPs and fishing gear.

2 STAKEHOLDER GROUPS COVERED BY CONSULTATION

The combination of a number of consultation activities (described in the next section) employed as part of this project captured the opinions of a broad range of stakeholder groups and interests. Consultations engaged with members of the public, EU and Member State representatives, academics, representatives of business and industry associations (manufacturers, plastics converters, retailers and Research and Development companies), NGOs, government bodies and public authorities and consumer associations.

3 CONSULTATION ACTIVITIES

The consultation approach involved a range of tools made available through a range of the Commission's ongoing work on plastics and the marine environment. This document draws on the following consultation activities:

- Two stakeholder workshops, carried out on 16 June and 14 September 2017, exploring the root causes and potential measures to deal with single-use plastics.
- The Reinventing Plastics Stakeholder Conference[3] held on 26 September 2017, which included a specific session on marine litter and single-use plastics.
- The 2018 Circular Economy Stakeholder Platform Conference on 20 February, which included a high-level session on plastics covering SUPs and fishing gear.
- Responses received to the Inception Impact Assessment open consultation/feedback.
- Interviews/ad hoc consultation with stakeholders.
- The recent Special Eurobarometer 468 (EC, 2017)[4] and Flash Eurobarometer 388 (EC, 2014)[5].
- The Online Public Consultation (OPC) on *'Reducing marine litter: action on single-use plastics and fishing gear*' launched from 15 December 2017 to 12 February 2018.

The results of each of the above engagement activities were separately analysed and are summarised in this document under respective sections. Synthesis and further analysis of the results was undertaken focusing on themes and cutting across consultation activities on issues around Single-Use Plastics and Fishing gear. These are reported across stakeholder categories

[2] A European Strategy for Plastics in a Circular Economy; COM(2018) 28 final, 18.1.2018. http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1516265440535&uri=COM:2018:28:FIN

[3] https://ec.europa.eu/info/plastics-conference_en

[4] http://ec.europa.eu/commfrontoffice/publicopinion/index.cfm/Survey/getSurveyDetail/instruments/SPECIAL/surveyKy/2156

[5] http://ec.europa.eu/commfrontoffice/publicopinion/flash/fl_388_en.pdf

drawing out key messages on stakeholder views around issues, actions and responsibilities in dealing with plastics in the marine environment and highlighting any differences in opinions by a particular sector or stakeholder, where these existed.

4 RESULTS OF STAKEHOLDER CONSULTATIONS ON SINGLE-USE PLASTICS

4.1 Stakeholder workshops and conferences

Two stakeholder workshops on SUPs took place on 16 June and 14 September 2017, each attended by 12-13 stakeholders representing producers, industry associations, NGOs, local authorities and Member States. The workshops focussed on gathering stakeholder views on the problems and root causes of single-use plastics and identifying measures to address 'single-use' plastic items.

In an attempt to define SUPs, workshop participants generally agreed that items classifying as SUPs, should fulfil the following criteria: Prevalence in marine environment; Short use phase; Consumed predominantly away from home and; Reusable or non-plastic alternatives exist, though some exceptions to the above will exist.

The root causes of the leakage of SUPs into the environment were discussed, and the overarching problems identified included low levels of re-use and low levels of recycling. In this context various causes were also discussed, such as item design of products and materials and consumer behaviour, with several participants arguing that a lack of regulatory measures to address these issues could also be seen as a root cause (though not as the only mechanism to address these).

A range of measures, of both regulatory and voluntary nature, was discussed including (but not limited to): incentives for producers and consumers (financial and behavioural), improvements in plastic waste collection, introduction of standards and bans and obligations introduced in product design and waste reporting. The respondents favoured an EU-wide waste prevention target and argued for cooperation between stakeholders to develop a holistic approach to address SUPs. With respect to regulatory measures, such as bans, the importance of public support was highlighted through examples. Discussions around the limitations of potential measures highlighted in particular that:

- There is limited evidence on the effectiveness of awareness raising campaigns, whilst there was general agreement that these are not sufficient as a standalone measure.
- Bans were considered a good way of enforcing the redesign of specific low-value items.
- However, if applied only at a national level such measures can interfere with the operation of the single market.
- Caution is advisable in the timeframe of implementation to ensure that substitution materials meet the standards and consumers are prepared.
- Charges were seen as a preventive measure, which can effectively influence consumer behaviour, while at the same time generating a new stream of revenue. Industry representatives highlighted, and others agreed, that a legislative approach was needed to ensure broad application and a level playing field.
- Setting targets for reduction in consumption of specific items was generally seen as an appropriate measure for EU-level action.

- There was the alternative option of ensuring that SUPs are not given away free at the point of sale.

Other potential measures identified included amending the Waste Framework Directive, better respect the waste hierarchy, the use of green public procurement to leverage sustainable materials and voluntary agreements to complement regulatory measures.

A stakeholder conference on *Rethinking plastics* took place on 26 September 2017 in Brussels. On the subject of SUPs, stakeholders suggested that in order to achieve the 50% marine litter reduction target voted by the European Parliament, an ambitious EU-wide strategy was required putting in place specific policy measures. It was further proposed that different measures might be appropriate for different SUPs.

Recognising the relationship between consumption and littering, and the priorities according to the waste hierarchy, binding consumption reduction targets linked to achievable time frames, were proposed. Consumer incentives, deposit-return schemes and provision of infrastructure for recycling were identified as potentially appropriate measures. As well as targeting the items, it was suggested that sources and pathways of marine litter should also be addressed. In this context, the effectiveness of public awareness initiatives was discussed with stakeholders noting a lack of demonstrable results, linked in particular to under-resourced campaigns. A mandate on green procurement was thought to be a good way of increasing demand in the market for alternatives to SUPs. There was consent that a holistic, balanced solution could be achieved by recognising shared responsibility amongst all stakeholders and employing a combination of measures that cut across reduction, reuse and recyclability. The omission of enforcement in the discussion was noted, with stakeholders arguing that revisions requested to the Waste Framework Directive would require littering to be made a criminal offence in all Member States.

The 2018 Circular Economy Stakeholder Platform Conference[6] also took place on 20-21 February 2018 and contributed to the existing consultations with further insights on actions and good practices for addressing plastics in the marine environment.

4.2 Inception Impact Assessment feedback

Feedback on the Inception Impact Assessment was received from 28 respondents across stakeholder categories. Representatives from the private sector emphasised on the importance of economic viability of recycling, poor implementation of existing rules and regulatory gaps. Across stakeholders, there was strong support for intervention at an EU level, with retailers and producers expressing a preference for voluntary approaches over regulatory measures. A number of respondents highlighted the need for a circular or life-cycle approach that supports prevention, and called for incentives on innovation and the removal of regulatory barriers at a national level. An extended scope was suggested by a number of respondents that would include an assessment of the impacts of primary and secondary microplastics and nanoplastics.

In discussions around potential measures, the diversity of SUPs gave rise to a differentiated approach depending on whether plastic marine litter is the result of items that are being recycled, items for which more sustainable alternatives exist, or finally items for which there is no readily available alternative. For items already captured, strong interest was expressed in Extended Producer Responsibility (EPR) Schemes, which were seen by many as highly

[6] http://www.eesc.europa.eu/sites/default/files/files/circular-economy-stakeholder-conference-programme_v20180212-2.pdf

effective. However, some did warn that such schemes are unable to address the leakage of plastics resulting from poor consumer behaviour towards recycling. Several respondents also referred to the success of deposit-return schemes (e.g. for bottles), although some recognised there are negative, and potentially disproportionate, economic implications for retailers. Factors that were identified as crucial to the success of such schemes included the efficiency of existing waste management systems, consumer behaviour, local infrastructure, the item's reuse potential, enforcement by Member States, as well as, EPR fees that are EU harmonised, consistent, scientifically reliable and allow for innovation. For items that could be replaced by more sustainable alternatives, retailers argued that this would be best achieved at a consumer level through awareness-raising and positive incentives. In decisions around substitute materials, priority should be given to materials that are readily recyclable. There was some caution towards the use of biodegradable plastics with several calling for clarity in the information provided and labelling for consumers. A number of respondents argued that the replacement of SUPs should be a priority, where no sustainable alternatives exist. Business representatives highlighted that any restrictions must take account of single market requirements and administrative burdens.

4.3 Interviews/ad hoc consultation

During the course of the study a range of ad-hoc, consultations were carried out in order to help develop the problem and impact analyses. These included a range of formal and informal interviews with stakeholders from public institutions, NGOs, industry associations and businesses. The number of stakeholders consulted in this way was in excess of 30. These interviews typically sought to shape and test potential intervention measures, to see what was technically feasible and the likely primary effects. Interviews were also used to gather specific data related to performance and costs and how these may change as a result of potential intervention measures.

A range of formal and informal interviews with relevant stakeholders from public institutions, NGOs, industry associations and businesses were also carried out, alongside the stakeholder workshops mentioned above, in order to help develop the impact analysis. The number of stakeholders consulted was around 30. The views of the stakeholder helped shape the measures, in relation to what was technically feasible, and provided data related to performance and costs.

Stakeholders across groups highlighted the importance of understanding the availability and function of the single-use non-plastic or multi-use alternatives, and the potential cost to manufacturers to switch materials in the production processes. In addition, consulting with the operators of multi-use refill schemes and water companies helped develop a better understanding of the operation of such schemes and the challenges they face.

4.4 Eurobarometer consultations

In their responses to the Special Eurobarometer 468 (EC, 2017)[7], around a third (33%) of Europeans identified marine pollution as the most important environmental issue. In response to questions on plastic waste and littering, around three-quarters of Europeans (72%) stated they have reduced their use of single-use plastic carrier bags, while a large percentage of those (38%) said they have cut down their use in the last 12 months.

[7] 27,881 EU citizens from 28 Member States were interviewed between 23 September and 2 October 2017.

The majority of respondents (between 89% and 94%) considered the following measures as important in reducing plastic waste and littering:

- products should be designed in a way that facilitates the recycling of plastic;
- industry and retailers should make an effort to reduce plastic packaging;
- people should be educated on how to reduce their plastic waste; and
- local authorities should provide more and better collection facilities for plastic waste.

With regard to consumers' responsibility in reducing plastic waste, 61% of respondents considered important that *consumers pay an extra charge for single-use plastic goods.*

Across the EU, there has been an increase in the numbers of Europeans who believe that decision-making on environmental protection should be taken jointly within the EU as opposed to the decision being taken by the national government alone.

A similar Eurobarometer consultation with European citizens in 2014 (Flash Eurobarometer 388) revealed Europeans' support[8] towards an EU-level target to reduce marine litter.

4.5 Open Public Consultation

The Online Public Consultation (OPC) on *'Reducing marine litter: action on single-use plastics and fishing gear*' launched from 15 December 2017 to 12 February 2018. This consultation complemented previous exercises conducted by the Commission, such as an OPC (October to December 2013) focussing on possible actions, by different stakeholder groups, to address the issue of marine litter[9]. The consultation received a total of 1,807 responses across Member States.

Across respondents, harm to animal welfare, human health risks and the impact on ecosystem services, ranked as the three most important issues linked to marine litter and SUPs. The vast majority of respondents (95%) across all stakeholder categories agreed that action to address the impacts of SUPs is both necessary and urgent. Most stakeholders were of the opinion that the EU should support mandatory instruments at a global or at least at European level. Government and public authority stakeholders diverged from this view noting that certain measures should be delivered at the European level whilst some may be best addressed at the local or national level.

A strong case was also made for reducing the presence of SUPs in the environment, with caps, lids and drinking bottles on the list of priorities. With reference to specific measures, respondents were in favour of beach cleaning, active 'fishing for litter' and the regular quantification of marine and beach litter. Industry and trade associations were the only stakeholder category that did not support active 'fishing for litter'. Recovery of marine litter found in fishing nets and recovery of fishing gear also generated support across most stakeholders.

In response to questions on their own use of SUP a large number of respondents noted a decrease in their use of light weight shopping bags, drink bottles and caps and lids. The consumption of crisps packets and sweet wrappers was the one that had changed the least. For those respondents that reported reductions in their use of SUP, the overwhelming majority attributed this change to increasing awareness of the environmental impacts of SUP. Respondents appeared most keen to reduce their use of plastic bottles above all items, with more than half of them reported that they had already done so. 77% of respondents stated that

[8] 26,595 EU citizens from 28 Member States were interviewed between the 3rd and 7th of December 2013.
[9] http://ec.europa.eu/environment/consultations/pdf/marine_litter.pdf

they would be willing to pay a small additional amount as part of a deposit refund scheme on plastic bottles. Extensive support (93%) was also expressed for policies, which would phase out disposable non-biodegradable plastic tableware in favour of those made with biodegradable materials or reusable alternatives, even when they involved a small price increase. Industry and trade association representatives were split in their willingness to pay because of such policies though they were still in favour of phasing out SUPs.

Considerable support (91%) was expressed for the introduction of rules that require cigarette companies to contribute financially to the costs of clearing up cigarette butts. Industry and trade associations were more reluctant to support this measure. Amongst the 5% of respondents to spoke against this measure were plastics converters and manufacturers though they only represented part of their sectors' responses. A similar suggestion for producers of sanitary items was also supported by the majority of respondents (79%), with the exception of representatives from the arts and entertainment sector and some of the manufacturers.

Members of the public also shared their opinions on diverse measures and approaches that could effectively reduce the environmental impacts of different SUPs. With reference to drink bottles, Deposit Return Schemes (DRS) were considered the most appropriate response (47%) followed by the option to set targets for use reduction (33%). Minimum design requirements found less support (20%) amongst respondents and were not favoured by business representatives. A different course of action was suggested for lightweight shopping bags with stakeholders across categories being in favour of a use reduction target (62%). For SUP, which could be replaced by more sustainable alternatives, such as cotton buds and cutlery, respondents supported legislative action (to better design or more sustainably produce these items) and use reduction targets. Similar legislative measures were thought to be appropriate even for items for which no obvious and proportionate alternative existed, such as cigarette butts and sanitary towels. For items falling under this SUP category, extended producer responsibility schemes were viewed as equally suitable.

Around 100 respondents provided links and 36 respondents provided attachments. Most of the links referred to NGO websites, petitions and initiatives as well as news and social media articles revolving around marine litter. Many of the uploaded attachments were explanatory statements from stakeholders providing further details on their response to the OPC. Other attachments contained policy statements from stakeholders and NGOs, such as EUROPEN, Suez, FoodDrinkEurope, Plastics Europe, Friends of the Earth, Starbucks and Veolia, as well as documents providing facts and figures on marine litter and beach clean-ups in various locations around the EU and the world. The last category varied between peer-reviewed academic papers and NGO fact-sheets. These documents helped corroborate the list of items covered in the analysis, however provided no data that could be used in the analysis.

4.6 SUP conclusions

Distinct measures were deemed appropriate for different SUP items. Diverse measures were discussed depending on existing legislation, the availability of separate waste collection and the availability of sustainable alternatives. Extended producer responsibility measures were viewed favourably by respondents across most categories. Implied costs associated to some of the measures and the importance of understanding these prior to any action were highlighted by industry and business representatives.

Extended producer responsibility was suggested as an important measure by workshop participants and OPC respondents alike. Stakeholders participating in these consultation activities also found merit in legislative approaches. The workshops provide a greater degree of granularity discussing the appropriateness of specific options, such as bans and charges, for

different levels or action. Reduction targets were popular across stakeholders although discussions around their effectiveness included caveats depending on the conditions of their implementation (e.g. time-bound targets).

Setting reduction targets for the consumption of specific SUPs was a popular choice in the OPC while it also emerged in stakeholder discussions during the workshops and conferences. However further individual measures and policies were broadly thought to be necessary in order to achieve overarching EU targets.

Across Eurobarometer and OPC consultations, stakeholders have indicated their willingness to pay for more sustainable alternatives to SUPs or their willingness to accept an extra charge acting as penalty for the use of SUPs.

Awareness campaigns were seen, by workshop and conference participants, as complementary measures to be employed in conjunction with other regulatory and voluntary measures.

4.7 Mitigation of Stakeholder concerns

Extended Producer Responsibility (EPR) Schemes

EPR schemes were seen by many as highly effective, but some producers argued that they are not suitable to address leakage into the oceans, which is caused by bad consumer behaviour, and indeed producers should not shoulder the cost for this misbehaviour, which is not related to their own economic activities and their treatment of waste.

> EPR schemes under the preferred option would involve obligations to cover clean-up costs for certain products, which is in line with the principle of producer responsibility for post consumption, but contributions would be spread across the sectors concerned and under established rules of financial and operational transparency.

Deposit Return Schemes

Take-back schemes deliver up to 90% return rates and make high quality feedstock available to manufacturing businesses, but retailers (including Eurocommerce) stated that they can have major economic and operational impacts for their businesses; these respondents advised that schemes should be tailor made and implemented at national level. Small retailers feared facing disproportionate burdens for example in storing and managing waste.

> Take-back schemes are one possible approach that may be taken, and may be considered as a form of EPR scheme. Member State and sectors concerned can decide if such schemes would be effective and viable. Existing schemes in MS and other countries have demonstrated that costs for retailers are generally covered by the scheme, and for smaller retailers exemptions are often possible or use of manual rather than automated deposit-return.

Charges at Point of Sale

Some retailers argued that charges at the point of sale could mislead and reduce environmental benefits; they therefore called for upstream solutions (obligations on manufactures and importers).

> The preferred approach of the impact assessment would enable charges at the point of sale should MS decide that such a measure would be effective for a particular product in reaching reduction targets. This approach has been highly effective in the case of single-use lightweight plastic carrier bags, with significant benefits at little or no cost (or indeed negative cost). Such an approach may be effective also for other products,

with costs to economic operators depending on how it is designed. SUP products are often given away free by (for example) food outlets but imply a cost, therefore a reduction in their use through a charge would in most cases imply a reduction in costs. Other measures (such as market restrictions or design requirements) would imply adaptations for upstream operators (producers and importers) rather than at point of sale.

Demand for secondary plastic

Some companies noted that a strong market for recycled materials is needed to ensure high recycling rates. This needs good quality recyclates, and competitive price for recycled materials. A chemical industry representative advised that measures should not create uncertainty along the value chain about certain established SUP applications, as this could impede investments in the transition to a circular economy.

The wider Plastics Strategy, of which this proposal forms a part, includes initiatives aimed specifically at boosting the use of recyclates and incentivizing investment in recycling capacity in Europe. The relative market prices of virgin and recycled plastic will depend mainly on factors that are outside the competence of the Commission and MS.

Food contact materials

Food and drink producers noted that not all plastic materials are suitable for food contact and safety (according to EU legislation), quality and avoiding food waste should be priorities. For food packaging biodegradable plastics fulfil the requirements of food contact approval (e.g. toxicity testing) and eco-toxicity tests.

Food contact legislation and hygiene standards would continue to apply.

Single Market

Business representatives reminded that any restrictions must take account of single market requirements.

The legislative basis of the proposal would ensure that any requirements relating to placing products on the market would be applied at the EU level, whilst other initiatives for reduction, such as those concerning consumer behaviour could be taken at the more appropriate level in accordance with the subsidiarity principle.

Inclusion of Microplastics

Some citizens and NGOs noted that the approach ignores the non-visual aspects of plastics pollution. It implies that clean-up and recycling alone will be sufficient to solve this problem. Microplastics should be considered, even if not in the scope of this proposal.

Most microplastics result from the decomposition of the plastic litter that finds its way into the marine environment. The proposal therefore tackles this pathway. Intentionally added microplastics are dealt with through the referral of these to the Chemicals Agency as another initiative under the Plastics Strategy. Microplastics released in the environment as a result of the use of products are also tackled under this Strategy by focused actions.

5 RESULTS OF STAKEHOLDER CONSULTATION ON FISHING GEAR

5.1 Inception Impact Assessment feedback

DG Mare received feedback on the Inception Impact Assessment from several stakeholders on 6 February 2018. The feedback centred around three main areas: (1) the baseline and its assumptions; (2) the policy options and (3) the interview questionnaire.

The main assumption of the baseline is the loss rate of plastic fishing and aquaculture gear for European seas. Initially, a loss rate of 30% was used, which was highlighted several times as too high. The feedback has been addressed by lowering the loss rate to 15% in the final report after revisiting the original sources, including interview results, adding additional sources and discussing the representativeness of these sources in Annex 5 of the main report.

Further, baseline feedback was received on the percentage weight distribution between aquaculture and fishing. Initially, the weight distribution was 77% plastic waste from aquaculture and 23% plastic waste from fishing. However, the distribution was based on Norwegian data, which is not representative for the EU-28. In the final report, the feedback has been addressed by changing the weight distribution for EU-28 to 60% plastic waste from aquaculture and 40% plastic waste from fishing by accounting for the differences of total fish catch and aquaculture production for Norway versus EU-28.

Lastly, feedback for the baseline was provided to include the effects of the revised PRF, revised Control Regulation and Waste Framework Directive in the baseline. These legislations and directives have now been taken into account, under the assumption that full implementation have taken place.

In regards to the policy options, the initial selection of four policy options to be evaluated remained. Therefore, the policy options outlined in the report are:

1. Extended producer responsibility (without deposit scheme);
2. Extended producer responsibility and deposit scheme;
3. Target setting (recycling target);
4. Alternative materials and product design.

The feedback provided on the policy options pointed out the importance of the impact quantification. Therefore, quantitative indicators for economic impact, administrative burden, environmental impact and social impact were identified and quantified to the best extent possible. Effects on stakeholders of the different policy options have been compared in a relative way using “+”, “0” and “-“.

Lastly, feedback was provided on the interview questionnaire, the third major area. The feedback has been incorporated in a revised questionnaire used for all interviews increasing the richness and depth of questions.

5.2 Interviews/ad hoc consultation

A total of 16 interviews and 2 follow-up calls with relevant stakeholders have been conducted. The stakeholders interviewed comprise of different Directorate Generals of the EC, national ministries, advisory councils, fisheries organizations, fishers, recycling companies and funds, NGOs and producer organizations.

Additionally, more than 15 other stakeholders including advisory councils, NGOs and ports have been contacted via email and telephone. Due to the short timelines, some stakeholders had difficulties to provide coordinated and quantified inputs.

The purpose of the interviews was to receive qualitative and quantitative input for the description, quantification and evaluation of the four policy options. The stakeholders had been selected based on their relevance to achieve the purpose of the interviews. The interviews conducted were guided by the interview questionnaire, but remained open for additional input and further discussion.

Stakeholders provided valuable insights and quantified data, which enriched and sharpened the policy options presented in the final report. The stakeholders agreed that it is necessary to reduce plastic marine litter from fishing and aquaculture. However, none of them was able to quantify the extent of plastic marine litter from fishing and aquaculture for European seas.

Further, they agreed that political action is required, also on a European level to address the loss of plastic fishing and aquaculture gear in European seas. The majority of stakeholders view the proposed four policy options as the right choice, while pointing out the general challenge to implement, enforce and monitor policies and measures at a European scale.

Among the policy options discussed, extended producer responsibility (EPR) with and without deposit scheme has been viewed as the most beneficial policy options for the purpose of reducing plastic fishing gear entering European seas. Extended producer responsibility has been viewed favourably because it can on the one hand cover costs for sorting, dismantling and transporting as well as on the other hand pay for retrieval operations. A deposit scheme has also been mentioned as favourable, as this would create a financial incentive for returning end-of-life gear to ports. However, concerns have been presented that such a scheme, would punish fishers for non-retrievable lost gear and create incentive for fishing for the intact set gear of others. Successful examples from Iceland, Norway and Denmark were repeatedly mentioned as reference cases. Recycling targets have been discussed as beneficial to divert end-of-life gear from landfill or incineration to recycling facilities. However, stakeholders described that better market uptake for recycled materials from fishing and aquaculture gear is required and that it was necessary to allocate parts of an EPR funding or government subsidies to create a competitive position for recycled materials from the packaging industry. Alternative materials were mentioned favourably, while at the same time it was said that research and development was lacking or the they were currently too expensive. Additionally, biodegradable plastics were deemed to be too expensive. It was also said that biodegradable plastics are currently not widely available, especially not plastics that would be biodegradable in salt water and large depths. Further, some stakeholders pointed out that biodegradable material would set the wrong incentive and would lead to disposing plastic fishing gear in the sea rather than returning it to port.

Overall, the conducted interviews enriched the report with first-hand knowledge and reflected the views of major stakeholders. The interview results have been incorporated in the final report.

5.3 Open Public Consultation

The Online Public Consultation (OPC) on *'Reducing marine litter: action on single-use plastics and fishing gear*' launched from 15 December 2017 to 12 February 2018 complemented previous exercises conducted by the Commission, such as an OPC (October to December 2013) focussing on possible actions, by different stakeholder groups, to address the issue of marine litter[10]. Each question has been analysed by excluding all respondents not answering the question at hand. To get the complete picture, respondents were allowed to

[10] http://ec.europa.eu/environment/consultations/pdf/marine_litter.pdf

choose “Do not know” for answers, which always comprise a certain percentage. For questions with the possibility to select multiple options responses have been evaluated by amount of stakeholder responding and not by total of options mentioned. The details and highlights of the analysis are elaborated on in the following paragraph, including an overview of the responses to open questions.

Some 340 people responded to the fisheries specific part of the OPC. Of those, 24% come from academia, 21% from NGO’s, 16% from government or public authorities, 7% from fisheries organizations, 7% from business, 6% from industry and trade associations and 16% indicating “Other” as category while the remainder with less than 1% per category comes from trade unions, regional sea conventions, international bodies, intergovernmental organisations, consumer associations or European institutions.

According to the open stakeholder consultation, 95% of respondents replied positively to the statement that action to **address the amount of marine litter** (including fishing gear) in the seas and on beaches is necessary and urgent (Question 2b - General). Focusing specifically on the amount of fishing gear in the seas and on beaches, 79% of the respondents think that it is necessary and urgent to act (Question 2 - Specific). The issue of impacts of marine litter on fisheries and aquaculture are considered by 100% of respondents of fisheries organizations as quite or very important (Question 1 – General). Of the total respondents, 53% consider it very important or quite important. Additionally, clean-up costs of litter are considered by 84% of respondents as very important or important (Question 1 - General).

Assessing the role of **stakeholders playing an important role for taking any further action** the EU, Member States, Local and regional authorities, fishers and fisheries organization are considered important (Question 3 - Specific). Only other international bodies, NGOs and the private sector seem to not play such an important role for reducing leakage of fishing gear into the marine environment. Especially, the latter one is surprising as the private sector could establish extended producer responsibility schemes to reduce marine litter or redesigning fishing gear. The most important role play the fishers, as they are the direct users of the gear (80% indicate fishers as very important stakeholders in this issue).

The stakeholder consultation also asked for the **assessment of the proportion of gear lost and discarded at sea per year**. For all gear lost (Question A - Specific), only 1% of respondents indicate that all gear is lost on an annual basis. There is larger variation per type of fishing gear among the stakeholders indicating that most gear is lost ranging from 3% for seine nets to 23% for lines and cords. The majority of responses is that some gear is lost ranging from 28% for seine nets to 54% for gillnets. Between 6% and 28% indicate that hardly any gear is lost and between 1% and 4% none. The remainder of the respondents (between 22% and 36%) indicated that they do not know.

For all gear discarded (Question B - Specific), only between 1% and 2% indicate that all gear is discarded per year and 3-13% indicate that most gear is discarded. The majority indicate that some gear is discarded. The indication of some fishing gear discarded varies per type of fishing gear ranging between 22% for seine nets and 43% for lines and cords. Between 7% and 22% indicate that hardly any fishing gear is discarded and between 4% and 11% indicate none. Looking as reference specifically at responses from fisheries organizations about discarded gill nets, 40% claim that some are discarded, 25% hardly any and 25% none.

Analysing the open fields in the stakeholder consultation it becomes apparent that there is no widely accepted estimate for lost and discarded fishing gear out there and there is a lack of data related to this topic. Therefore the open comments varied widely from 50% loss (reference to SPEKVIS project Belgium for dolly rope) and only 0.8% for demersal gillnets

(reference to Ayaz et al., 2010), with other respondents citing 10% (reference to Gilman, 2015) or 20% (anecdotal evidence). In absolute terms comments vary from 5,500-10,000 net fragments lost per year (reference to Baltic Seas 2020) to 640,000 tons lost annually worldwide (reference to Macfadyen et al., 2009).

The response of the stakeholders to the question about the **selection of measures to help reduce lost and discarded gear** (Question 5 - Specific, multi-option) the most selected options are:

1. Incentive to bring fished up litter and end-of-life gear ashore (88%)
2. Better collection and sorting facilities on vessels and at ports (70%)
3. Incentives/Funding of retrieval action (68%), and
4. Better enforcement of existing rules (67%)

The open field comments expanded on the list above. First, stakeholders went one step ahead by proposing EPRs as measure to reduce ALDFG. Other comments were made by stakeholders requesting higher penalties for the fishing and aquaculture industry punishing its role in the pollution. Further, several respondents elaborated on the risk and inefficiency of retrieval actions, which have to be carefully evaluated before undertaken. Other comments underpinned the importance of education and awareness raising of fishers to reduce plastic fishing and aquaculture gear ending in the seas. The introduction and enforcement of gear marking was mentioned repeatedly. Additionally, respondents highlighted that high harbour costs lead to more discarding of gear at sea, even though suitable port reception facilities exist. Lastly, several respondents agreed that the lack of suitable port facilities are a disincentive for fishers to return gear to port entering formal waste management.

One further issue revealed is **reporting and retrieving of lost gear** (Question 6 and 7 - Specific). 56% respond that hardly any lost gear is reported and 52% state that hardly any is retrieved. Only 3% of the respondents state that most or all is reported and only 5% state that most or all lost gear is retrieved. Gear retrieval is considered most successful if better retrieval equipment is available and more incentives to bring fished up litter and end-of-life gear ashore as well as incentives/funding of retrieval actions. In the open comments, specifically a stakeholder pointed out that often gear cannot be retrieved due to either safety limitations or simply traceability of lost gear in sea. Further, a relevant comment is that in certain countries legislation has to be changed to make gear retrieval possible as for example in Italy retrieved gear are classified as special waste and thus their disposal has to be paid by fishers.

According to the stakeholder consultation (Question 9 – Specific, multi-option), **public funds** should be used mainly for the recovery of marine litter found in fishing nets during normal fishing activities ("passive fishing for litter") and recovery of fishing gear and marine litter washed up on beaches. However, here stakeholders highlighted specifically that rather than public funds fishers and producers should be charged and that focus should be placed on prevention rather than retrieval. Lastly, a strong comment has been made that subsidizing the fishing gear recycling industry would be useful to help it grow and encourage better end of life treatment of fishing gear.

Further, the open stakeholder consultation addresses which additional targeted **measures would support the bringing back of gear ashore** (Question 10 - Specific, multi-option). Respondents favour with 59% deposit return schemes levied on fishers and with 53% extended producer responsibility scheme including a levy on gear. More than one third of the stakeholders consulted see public support as a suitable additional measure, whereas, 13% do not know and another 13% see additional other measures as useful. In the open field

addressing other measures as well as additional comments, stakeholders raise doubts about deposit schemes as they might punish fishermen , who migh not get their deposit back, for unintentionally lost or not recoverably gear. Additionally, stakeholders remark that deposit schemes for gears with long lifespans render return scheme inefficient. Further, they highlight that disposal at port should not be more expensive than illegal loss at sea, wherefore an EU-wide registration of nets as well as sample controls are proposed. Lastly, a stakeholder highlighted that an exclusive focus on collection is not sufficient, therefore the focus has to be shifted to the recycling of fishing gear. However, the stakeholder points out that support is required for gear recycling companies as they face challenges selling their recycles proposing therefore an incentive for market uptake and (mandatory) use of a % recycled content in various products

Reviewing the sorting of waste at the port in line with EU waste legislation and as envisaged in the PRF proposal (Question 11 - Specific), of the 50% providing another answer than "do not know" 60% agree that there is any sorting of waste. However, the remaining 40% point out that there is no sorting of waste at ports, which are normally mandated by the Port Reception Facility Directive.

Additionally, the open stakeholder consultation sheds light on the **recycling** focusing on current recycling of gear and potentially recycling of gear (Question 12 - Specific). Only 6% indicate that more than 25% is recycled, however 42% of the respondents indicate that potentially more than 25% could be recycled. Further, the stakeholder consultation assesses which measures could potentially increase recycling rates (Question 13 - Specific, multi-option), which 28% indicate investment in recycling facilities and another 28% preferring the introduction of EPR or bring back schemes. Also, 26% believe that the preferred measure to increase recycling rates is to improve the transport of gear from ports to waste management/recycling facilities. 54% indicate not knowing whether re-use is undertaken in their country or sea are, 18% indicate that no re-use is happening, 21% state occasionally and only 7% say routinely (Question 14 - Specific). Lastly, an open field in the stakeholder consultation also allowed to indicate additionally which gear or material is currently recycled, which revealed an interesting fact that an Italian recycling company can only reach breakeven capacity, if used fishing nets are imported from China because they do not receive enough from Italian fisheries and ports. On the one hand repair of recycling can be also seen as a sort of recycling then leading to a 100% recycling rate, whereas on the other hand also incineration sometimes accounts for recycling rates.

Lastly, in the light of **alternative product design and materials**, it is assessed which gear has the best potential for substitution of plastics with other materials (Question 15 - Specific, multi-option). The answers are very equal, however among the four options cords/lines, fish aggregating devices, buoys and dolly ropes, dolly ropes is selected with the least potential despite the dolly rope free project being the only project for fishing gear attempting to replace plastics and innovate with materials.

5.4 Fishing gear conclusions

The picture arising from the different sources consulted is that stakeholders highlight where action is necessary and urgent to reduce the detrimental effects of plastics from ALDFG. The policy options of extended producer responsibility and deposit scheme were favoured in addition to better port reception facilities. Analysis of the options favoured by respondents also shows that EPR combined with a deposit scheme is deemed to have positive cost-benefit effects and to contribute to the target of the plastics strategy to reduce the level of plastics in European seas.

5.5 Mitigation of Stakeholder concerns

That non-EU vessels will not be covered

Fishy Filaments Ltd, a plastic recycler wrote

> *Increased attention to sources of nets from fishers operating in international waters, especially from fleets outside the EU (Russia, China, etc). Satellite monitoring of IUU fisheries should include assessment of net disposal actions.*

At the moment, satellite technology does not allow such actions to be monitored. However, introduction of a successful system for the EU will encourage other authorities to follow suit.

That we have not adequately considered biodegradable fishing nets as a solution

Novamont SpA, manufacturers wrote

> *The European Commission is funding research for biodegradable applications used in the marine environment. Open-bio , follow-up project of a previous one funded under the FP7, has developed new methodologies for the analysis of marine biodegradation. Through these test methods it was possible to show that some MATER-BI materials achieved biodegradation of 90 % in less than a year. These results have been verified within the EC Environmental Technology Verification (ETV) pilot project. MATER-BI is therefore a suitable material for the production of plastic objects with high risk of dispersion in the sea (fishing gears or fish-farming gears). http://www.life-ghost.eu/index.php/en/project/objectives/8-news/109-mater-bi-of-new-generation-an-italian-biodegradable-plastic-material-to-be-used-for-fishing-gears*

An NGO wrote

> *Prohibition of storm loss grants provided to buy new plastic pots when old ones are lost. If grants are given then only for natural materials. Jobs and revival of traditional willow and hazel pot making would benefit the industry and the target species.*

Research is still at an early stage. The Commission is looking into new ways of bringing innovative ideas to market through the use of financial instruments that reduce investor risk.

That port authorities are not motivated to treat waste adequately.

A.M.A. - Associazione Mediterranea Acquacoltori wrote

> *Nel caso delle reti da molluschicoltura sarebbe opportuno che fossero gli allevatori a occuparsi, anche in maniera consorziate, di conferirle alle società di raccolta e smaltimento. Ora, in base alla normativa italiana, quando applicata, spetta all'autorità portuale.*

The proposed Extended Producer Responsibility for fishing gear would remove responsibility from the ports. It will be up to Member States to set up an appropriate system but one would expect the producers to have a say in how it is implemented.

ANNEX 3: CURRENT SITUATION: FACTS AND FIGURES

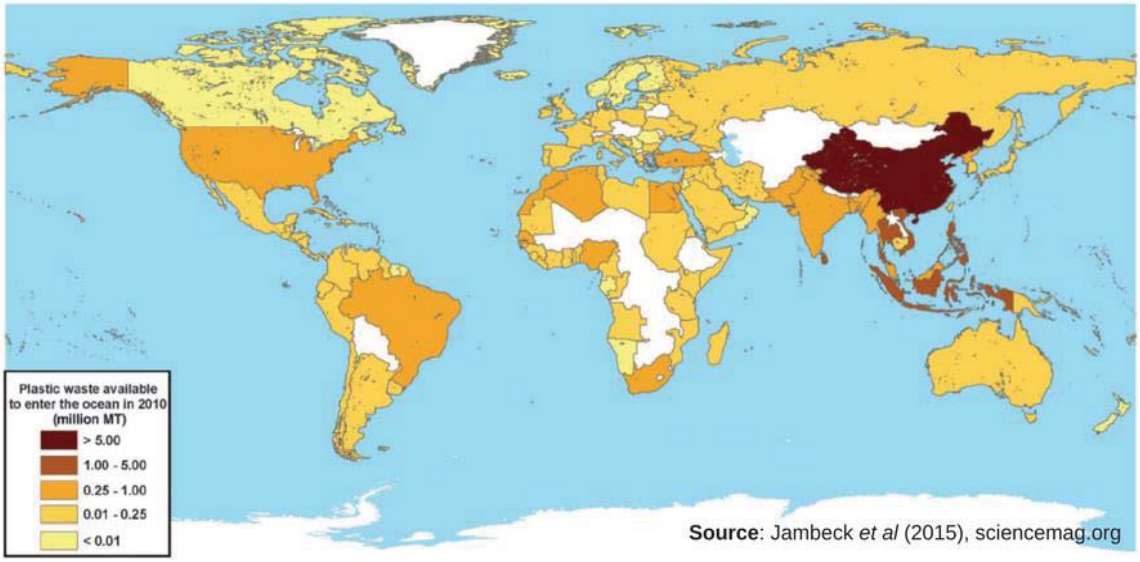
1 MARINE LITTER AS A GLOBAL ISSUE

Major land based sources of plastic marine litter are: storm water discharges, sewer overflows, tourism-related litter, wastes released from dumpsites near the coast or river banks, illegal dumping, industrial activities, improper transport, consumer cosmetic products, synthetic sandblasting media or polyester and acrylic fibers from washing clothes. Sea-based sources include: shipping, fishing, aquaculture and offshore.

1.1 Litter volumes entering the oceans

It is estimated[11] that 4.8 to 12.7 million tonnes of plastic waste enter our oceans per year. These figures need to be treated with caution but they do give an idea of magnitude of the problem.

Figure 1. Plastic waste available to enter the oceans (million tonnes) (2010)[12]



According to Jambeck *et al.* (2015)[13], over 50% of the global leakage into the marine environment currently comes from five emerging markets in Asia.

River networks facilitate the transport of plastics, thus connecting most of the global land surface to the ocean[14]. According to Schmidt *et al.* (2017), rivers from the 10 top-ranked catchments contribute between 88% and 94% of the total plastic debris (again, figures to be treated with caution).

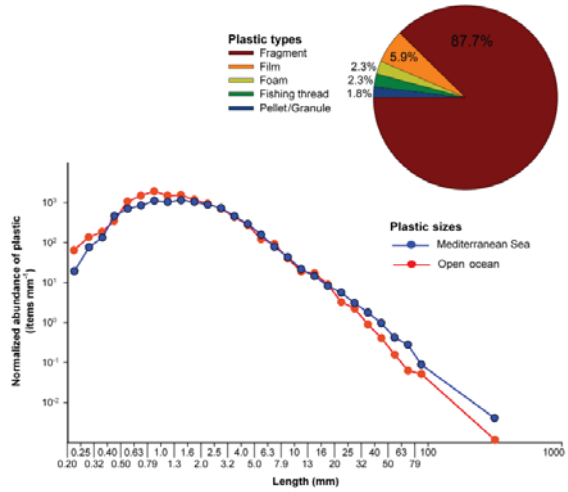
[11] Jenna R. Jambeck et al. (2015), Plastic waste inputs from land into the ocean, Science, 347 (6223), 768-771 (DOI: 10.1126/science.1260352), http://science.sciencemag.org/content/347/6223/768
[12] Global map with each country shaded according to the estimated mass of mismanaged waste (million tonnes) generated in 2010. Countries not included in the study are shaded in white (Jambeck et al., 2015, p. 769).
[13] Jenna R. Jambeck et al. (2015), Plastic waste inputs from land into the ocean, Science, 347 (6223), 768-771 (DOI: 10.1126/science.1260352)
[14] Christian Schmidt, Tobias Krauth, Stephan Wagner. Export of Plastic Debris by Rivers into the Sea. Environmental Science & Technology, 2017; DOI: 10.1021/acs.est.7b02368

1.2 Accumulation of plastics in the environment

Since 1980, over 150 million tonnes of plastic marine litter are estimated to have accumulated, out of which between 1.4 and 3.7 million tonnes in the EU. Deep-sea sediments accumulate microplastics and retention of macro and microplastics in particular sea-bed locations is increased by topographic features. Research[15] suggests that Europeans currently consume up to 11,000 pieces of plastic in their food each year as a result of consumption of seafood.

Waste patches in the Atlantic and the Pacific oceans are estimated to be around 100 Mt, about 80% of which is plastic. Plastic is accumulating in the Mediterranean Sea at a similar scale to that in oceanic gyres (the rotating ocean currents in the Indian Ocean, North Atlantic, North Pacific, South Atlantic and South Pacific)[16]. Plastic debris found in the Mediterranean surface waters are composed by millimetre-sized fragments, together with a proportion of large plastic objects, larger than the one present in oceanic gyres.

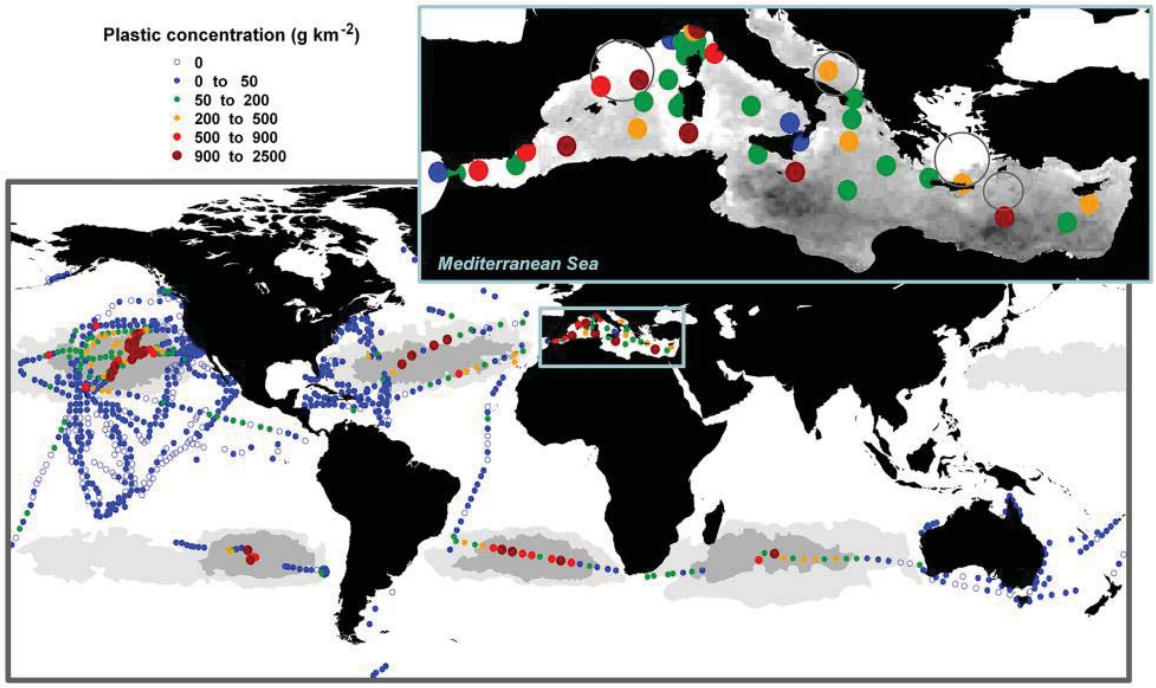
Figure 2. Size distribution and aspect of the floating plastic debris collected in the Mediterranean Sea[17]



The accumulation of plastic in the Mediterranean Sea is likely to be the result of a significant regional plastic input combined with a limited export to the Atlantic Ocean. In addition to this, the Mediterranean Sea acts as a convective basin, absorbing floating plastic originating from the Atlantic and many other terrestrial and maritime sources (e.g. the inputs from the Nile River). The figure below shows the concentrations of plastic debris in surface waters of the Mediterranean Sea compared to the plastic concentrations reported for the global ocean.[18]

[15] Unpublished study cited in http://news.sky.com/story/micro-plastics-in-seafood-could-be-a-health-risk-experts-fear-10739835
[16] PLOS, A Cozar, Plastic Accumulation in the Mediterranean Sea, 2015
[17] Ibidem
[18] Ibidem

Figure 3. Concentrations of plastic debris in surface waters of the Mediterranean Sea compared to the plastic concentrations reported for the global ocean[19]



2 MARINE LITTER FROM EUROPE

2.1 Marine litter measurement

The Marine Strategy Framework Directive (MSFD) requirement to ensure that properties and quantities of litter do not cause harm to the environment implies that baselines and threshold values have to be set at EU level. This work is being coordinated at EU level and a related JRC report[20] on the most frequently found litter items on beaches provides a good assessment of marine litter. This work is ongoing with a view to facilitate reaching the aspirational target of the Circular Economy Package to reduce by 30% the amount of beach litter and fishing gear lost at sea by 2020.

The European Marine Observation and Data Network EMODnet partnership in collaboration with regional sea conventions are assembling and harmonising the data in order to provide a better overall picture of the concentrations in European seas and sea-beds that will help assess progress in meeting targets and support remedial action. Additional data will be made publicly available during 2018.

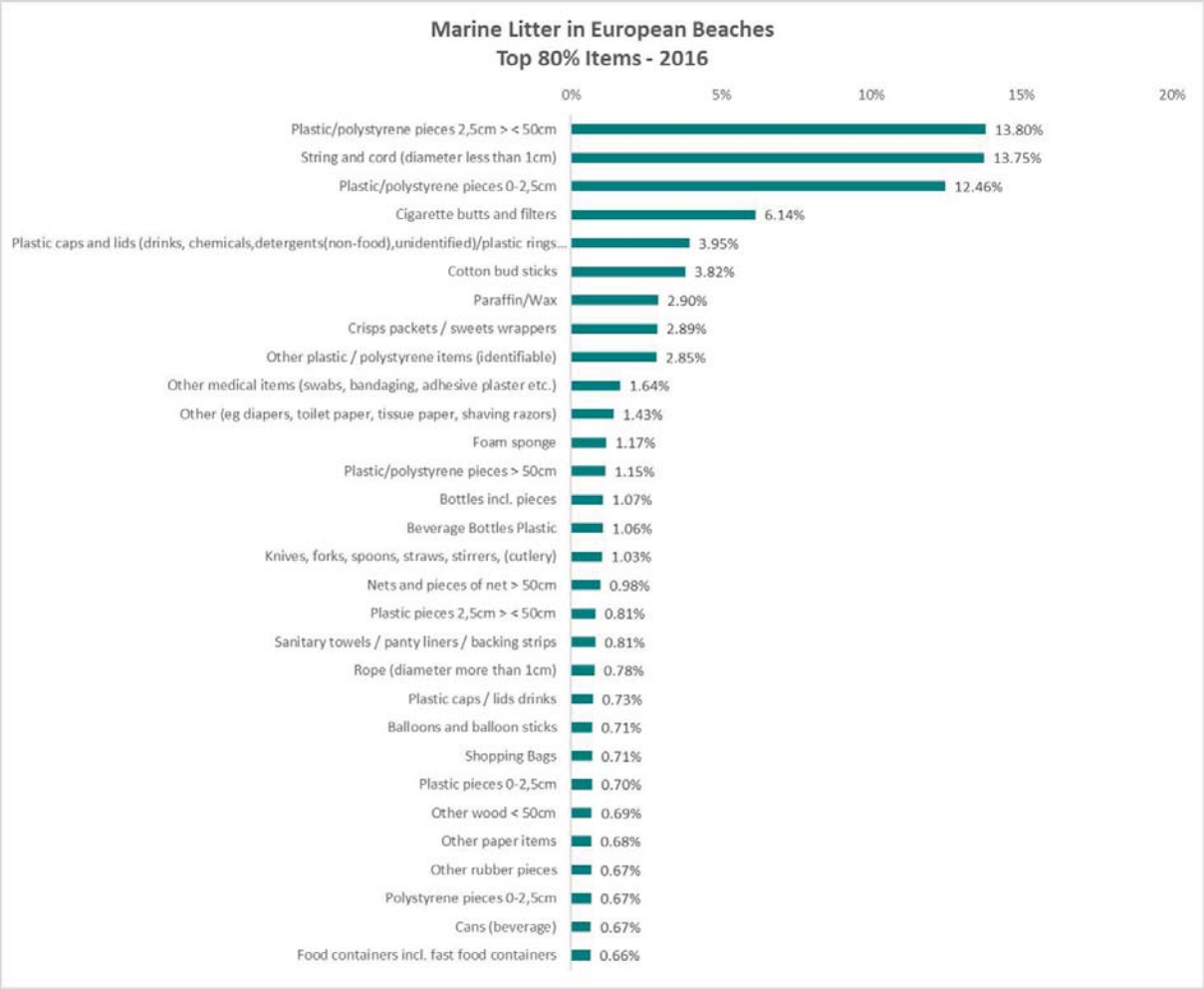
The European Environmental Agency EEA has developed Marine Litter Watch[21], a citizen science based tool that can help fill data gaps relevant for policy, while raising awareness about the problem of litter and the policy response to it; it is already being used in European-wide campaigns and complements many private initiative tools.

[19] Ibidem. Note that this study sampled only microplastic, with a net of 1 m opening. Macro plastic (for which a much larger sampling area is needed in order to derive representative results) was not considered.
[20] Top Marine Beach Litter Items in Europe. JRC108181, Authors A.M.Addamo, P.Laroche and G.Hanke
[21] https://www.eea.europa.eu/themes/water/europes-seas-and-coasts/marine-litterwatch#tab-news-and-articles

EU funding is being deployed to understand marine litter[22], supporting global, national and regional action.

For the purpose of this Impact Assessment, the best information comes from beach counts. The table below shows information about marine litter items found on European Beaches from the JRC's Technical Group of Marine Litter Activities (monitoring programmes, clean-up campaigns and research projects), collected from 276 beaches of 17 EU Member States and 4 Regional Seas during the year 2016. A total of 355,671 items observed during 679 surveys are ranked by abundance, mainly according to the MSFD Master List Categories of Beach Litter Items.

Table 1: Marine litter items found on European beaches, share (%) by item-count, top 80%, 2016



The following table shows the same information but along with a longer list covering the top 125 along with the code and number of items found.

[22] For instance, in the Arctic Region, the Circular Ocean INTERREG project is testing new opportunities for reusing old fishing nets, including a material to remove pollutants from water (http://www.circularocean.eu/). In the Baltic Sea Region, the BLASTIC project maps potential litter sources in urban areas and monitors litter levels in the aquatic environment (https://www.blastic.eu/). Both projects are supported by the European Regional Development Fund.

Table 2: Marine litter items found on European beaches, share (%) by item-count, 2016

Ranking	Material	General Name Litter Item	Master List Code	Number of Items	%
1	Plastic	Plastic/polystyrene pieces 2,5cm > < 50cm	G76	49082	13,80%
2	Plastic	String and cord (diameter less than 1cm)	G50	48919	13,75%
3	Plastic	Plastic/polystyrene pieces 0-2,5cm	G75	44309	12,46%
4	Plastic	Cigarette butts and filters	G27	21854	6,14%
5	Plastic	Plastic caps and lids (drinks, chemicals, detergents (non-food), unidentified)/plastic rings from bottle caps/lids	G20-G24	14064	3,95%
6	Plastic	Cotton bud sticks	G95	13579	3,82%
7	Chemicals	Paraffin/Wax	G213	10305	2,90%
8	Plastic	Crisps packets/sweets wrappers	G30	10267	2,89%
9	Plastic	Other plastic/polystyrene items (identifiable)	G124	10142	2,85%
10	unidentified	Other medical items (swabs, bandaging, adhesive plaster etc.)	G211	5841	1,64%
11	Plastic	Other (e.g. diapers, toilet paper, tissue paper, shaving razors)	GX1	5077	1,43%
12	Plastic	Foam sponge	G73	4156	1,17%
13	Plastic	Plastic/polystyrene pieces > 50cm	G77	4103	1,15%
14	Glass/Ceramics	Bottles incl. pieces	G200	3818	1,07%
15	Plastic	Beverage Bottles Plastic	G6-G8	3776	1,06%
16	Plastic	Knives, forks, spoons, straws, stirrers, (cutlery)	G34-G35	3666	1,03%
17	Plastic	Nets and pieces of net > 50cm	G54	3499	0,98%
18	Plastic	Plastic pieces 2,5cm > < 50cm	G79	2878	0,81%
19	Plastic	Sanitary towels/panty liners/backing strips	G96	2877	0,81%
20	Plastic	Rope (diameter more than 1cm)	G49	2792	0,78%
21	Plastic	Plastic caps/lids drinks	G21	2605	0,73%
22	Rubber	Balloons and balloon sticks	G125	2542	0,71%
23	Plastic	Shopping bags	G3	2520	0,71%
24	Plastic	Plastic pieces 0-2,5cm	G78	2504	0,70%
25	Processed/worked wood	Other wood < 50cm	G171	2468	0,69%
26	Paper/Cardboard	Other paper items	G158	2402	0,68%
27	Rubber	Other rubber pieces	G134	2385	0,67%
28	Plastic	Polystyrene pieces 0-2,5cm	G81	2385	0,67%
29	Metal	Cans (beverage)	G175	2373	0,67%
30	Plastic	Food containers incl. fast food containers	G10	2330	0,66%
31	Plastic	Shotgun cartridges	G70	2263	0,64%
32	Plastic	Strapping bands	G66	2239	0,63%
33	Plastic	Small plastic bags, e.g. freezer bags	G4	2131	0,60%
34	Plastic	Tangled nets/cord	G56	2108	0,59%
35	Plastic	Cups and cup lids	G33	1995	0,56%
36	Metal	Bottle caps, lids and pull tabs	G178	1982	0,56%
37	Paper/Cardboard	Cigarette packets	G152	1948	0,55%
38	Plastic	Nets and pieces of net < 50cm	G53	1865	0,52%
39	Glass/Ceramics	Other glass items	G210	1710	0,48%
40	Glass/Ceramics	Construction material (brick, cement, pipes)	G204	1626	0,46%
41	Plastic	Sheets, industrial packaging, plastic sheeting	G67	1441	0,41%
42	Metal	Foil wrappers, aluminium foil	G177	1414	0,40%
43	Plastic	Fishing line/monofilament (angling)	G59	1351	0,38%
44	Cloth/Textile	Clothing/rags (clothing, hats, towels)	G137	1250	0,35%
45	Plastic	Toys & party poppers	G32	1234	0,35%
46	Plastic	Drink bottles ≤ 0,5l	G7	1188	0,33%
47	Plastic	Caps/lids	G21-G23	1160	0,33%

48	Plastic	Cleaner bottles & containers	G9	1148	0,32%
49	Plastic	Mussel nets, Oyster nets	G45	1142	0,32%
50	Metal	Household batteries	G195	1132	0,32%
51	Plastic	Drink bottles > 0,5l	G8	1131	0,32%
52	Plastic	Plastic bags (opaque and clear)	G2-G4	1093	0,31%
53	Plastic	Polystyrene pieces 2,5cm > < 50cm	G82	1039	0,29%
54	Cloth/Textile	Other textiles (incl. rags)	G145	1022	0,29%
55	Paper/Cardboard	Cups, food trays, food wrappers, drink containers	G153	956	0,27%
56	Processed/worked wood	Ice-cream sticks, chip forks, chopsticks, toothpicks	G165	850	0,24%
57	Plastic	Cigarette lighters	G26	795	0,22%
58	Cloth/Textile	Tampons and tampon applicators	G144	789	0,22%
59	Plastic	Foam packaging/insulation/polyurethane	G74	752	0,21%
60	Processed/worked wood	Other wood > 50cm	G172	717	0,20%
61	Glass/Ceramics	Glass or ceramic fragments > 2,5cm	G208	714	0,20%
62	Paper & cardboard	Paper (including newspapers and magazines)	G154-G157	694	0,20%
63	Plastic	Pens and pen lids	G28	642	0,18%
64	Plastic	Rope, string, cord	G49-G50	629	0,18%
65	Plastic	Shoes/sandals	G71	623	0,18%
66	Plastic	Other bottles & containers (drums)	G13	617	0,17%
67	Plastic	Crisp/sweet packets and lolly sticks	G30-G31	593	0,17%
68	Plastic	Plastic caps/lids unidentified	G23	576	0,16%
69	Plastic	Straws and stirrers	G35	566	0,16%
70	Paper/Cardboard	Cardboard (boxes and fragments)	G148	557	0,16%
71	Plastic	Plastic Pieces	G74-G83/G103-G106/G122	545	0,15%
72	Plastic	Cutlery and trays	G34	537	0,15%
73	Plastic	Medical/pharmaceuticals containers/tubes	G100	495	0,14%
74	Metal	Other metal pieces > 50cm	G199	482	0,14%
75	Rubber	Condoms (incl. packaging)	G133	480	0,13%
76	Plastic	Floats/buoys	G62-G63	478	0,13%
77	Plastic	Light sticks (tubes with fluid) incl. packaging	G60	458	0,13%
78	Metal	Wire, wire mesh, barbed wire	G191	455	0,13%
79	Plastic	Mesh vegetable bags	G37	452	0,13%
80	Plastic	Gloves (industrial/professional rubber gloves)	G41	445	0,13%
81	Paper/Cardboard	Cartons/tetrapak (others)	G151	434	0,12%
82	Plastic	Beach use related cosmetic bottles and containers, e.g. sunblockers	G11	422	0,12%
83	Plastic	Plastic bag collective role; what remains from rip-off plastic bags	G5	420	0,12%
84	Plastic	4/6-pack yokes, six-pack rings	G1	369	0,10%
85	Metal	Aerosol/spray cans (industry)	G174	369	0,10%
86	Plastic	Food containers, cups and cup lids	G10/G33	362	0,10%
87	Processed/worked wood	Corks	G159	348	0,10%
88	Paper/Cardboard	Newspapers and magazines	G154	337	0,09%
89	Wood	Processed timber and pallet	G160-G161	327	0,09%
90	Plastic	Bottles & jars	G6	322	0,09%
91	Metal	Gas bottles, drums and buckets (> 4L)	G189	320	0,09%
92	Glass/Ceramics	Light bulbs	G202	294	0,08%
93	Cloth/Textile	Shoes and sandals (e.g. leather, cloth)	G138	275	0,08%
94	Rubber	Tyres and belts	G128	259	0,07%
95	Cloth/Textile	Rope, string and nets	G142	243	0,07%
96	Processed/worked	Paint brushes	G166	234	0,07%

	wood				
97	Cloth/Textile	Carpet and furnishing	G141	232	0,07%
98	Metal	Industrial scrap	G186	232	0,07%
99	Metal	Cans (food)	G176	210	0,06%
100	Metal	Other metal pieces < 50cm	G198	208	0,06%
101	Plastic	Lolly sticks	G31	204	0,06%
102	Cloth/Textile	Sacking (hessian)	G140	203	0,06%
103	Plastic	Crates and containers/baskets	G18	199	0,06%
104	Plastic	Other cosmetic bottles & containers	G12	190	0,05%
105	Plastic	Plastic rings from bottle caps/lids	G24	185	0,05%
106	Plastic	Buckets	G65	179	0,05%
107	Plastic	Dog faeces bag	G101	178	0,05%
108	Paper/Cardboard	Paper bags	G147	178	0,05%
109	Organic	Fruit, food, pastry, candy and ice cream	GX21	176	0,05%
110	Plastic	Tags (fishing and industry)	G43	174	0,05%
111	Plastic	Jerry cans (square plastic containers with handle)	G16	170	0,05%
112	Plastic	Injection gun containers	G17	168	0,05%
113	Rubber	Balloons, balls and toys	G125-G126	164	0,05%
114	Plastic	Combs/hair brushes/sunglasses	G29	161	0,05%
115	Plastic	Syringes/needles	G99	160	0,04%
116	Pollutants	Wax small	GX2	153	0,04%
117	Plastic	Food containers, candy wrappers, cups and cup lids	G10/G30/G33	147	0,04%
118	Plastic	Tobacco pouches/plastic cigarette box packaging	G25	147	0,04%
119	Paper/Cardboard	Cartons/tetrapak milk	G150	145	0,04%
120	Plastic	Engine oil bottles & containers < 50 cm	G14	140	0,04%
121	Plastic	Car parts	G19	135	0,04%
122	Plastic	Gloves (washing up)	G40	132	0,04%
123	Plastic	Crab/lobster pots and tops	G42	120	0,03%
124	Plastic	Plastic sheeting from mussel culture (Tahitians)	G47	119	0,03%
125	Plastic	Fibre glass/fragments	G68	113	0,03%

Two items in the original long list merit some further explanation. “Other medical items” is rather a group that would need to be disaggregated into several items, each of which will then have a much smaller part in marine litter. Only parts of these are plastics. Foam sponge is coming from several products, mostly from different kind of matrasses, which are multi use. Such a product would call for a completely different policy approach.

A significant type - making up around half of marine litter - is ‘single-use plastics’. Marine litter from sea-based sources is also significant: plastic waste generated on boats and ships, fishing gear, and plastics used in aquaculture are more likely to end up in the marine environment (abandoned, lost and otherwise discarded fishing gear (ALDFG)).

The analysis of the beach litter reveals that 49% of all identifiable marine litter items, are single-use plastic items, while 33% are other plastic items such as those associated with fishing or items not considered to be single-use; and 18% are non-plastic items.

Figure 4: Composition of marine litter

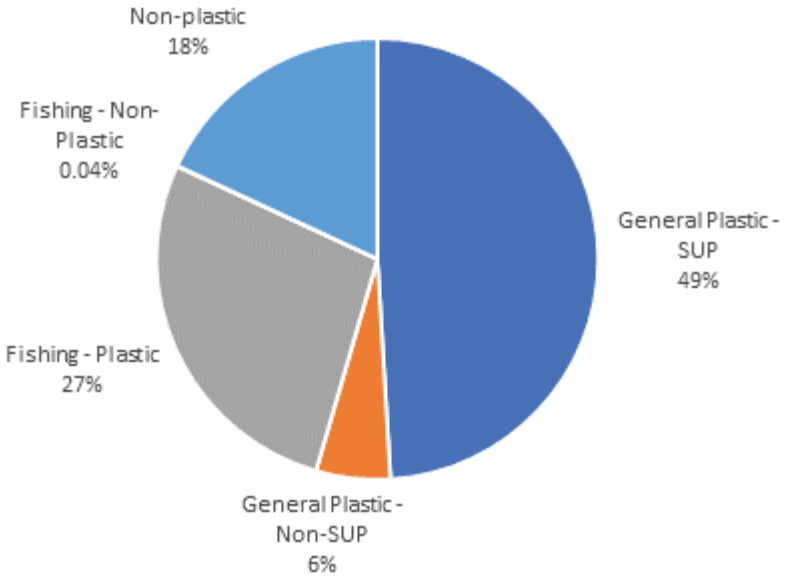
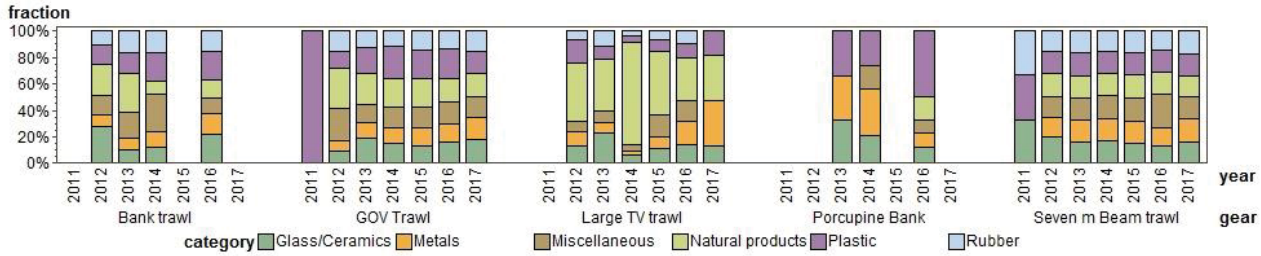


Figure 2. Composition of items found in nets in western Atlantic and Baltic (2011-2017)

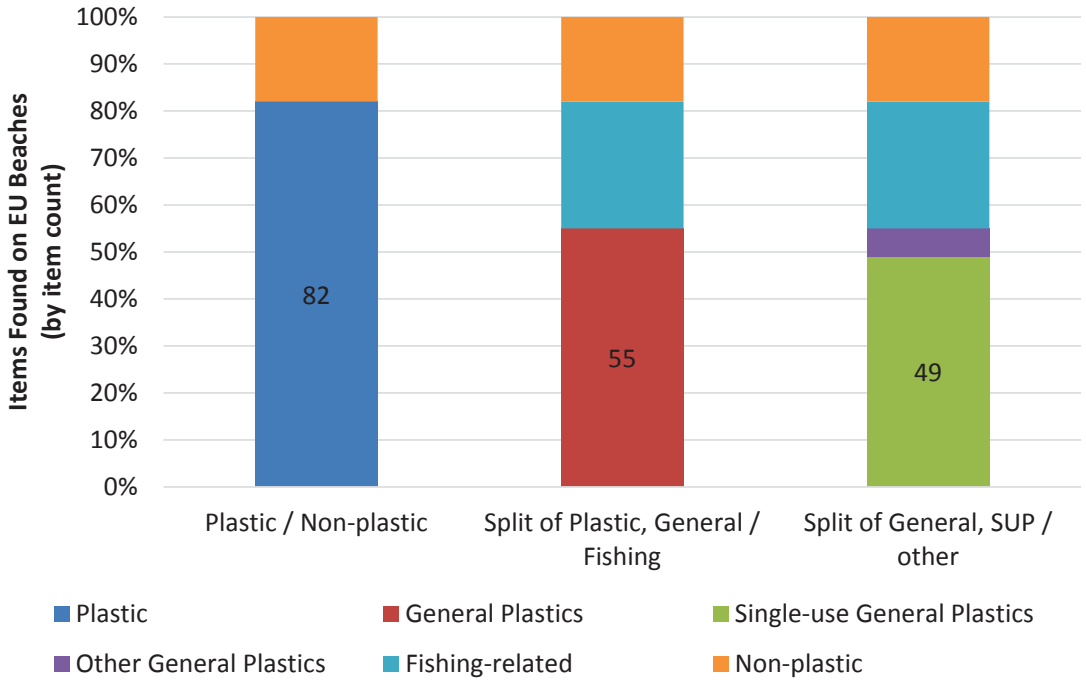


Source: ICES DATRAS database[23] *and analysed by EMODnet*[24]

Harmonisation of records of marine litter composition on seafloor is also underway. Figure 2 shows what has been brought up in the nets of fishing vessels 2011-2017[25]. It covers an analysis of nearly 3,000 hauls throughout the western Atlantic Ocean and the Baltic Sea.

[23] http://www.ices.dk/marine-data/data-portals/Pages/DATRAS.aspx
[24] http://www.emodnet.eu/
[25] EU's European Marine Observation and Data Network, EMODnet, stored in the ICES DATRAS database: http://www.emodnet.eu/

Figure 3. Composition of Marine Litter



Source: Eunomia, based on JRC data

The following table provides another perspective, viewing the data from the question of whether they are packaging or not and SUP or not.

Table 3: Marine litter items – splits by single-use categories

Non-packaging, Non SUP
Non-packaging SUP
Packaging, Non SUP
Packaging SUP

Supercategories, item type	Amount	% Amount	Amount as % of supercategory
PLASTIC			
Cigarette butts, Paper/plastic	27416	7%	19%
Caps and lids - drinks, Plastic	18417	5%	13%
Cotton bud sticks, Sanitary	13928	4%	10%
Crisps packets / sweets wrappers, Plastic	11366	3%	8%
Other, identifiable, non-packaging, non SUP <100 items, Plastic, Polystyrene, Rubber	10841	3%	8%
Drinks bottles, Plastic	7716	2%	5%
Other, Sanitary	5840	2%	4%
Sanpro - Towels / panty liners / backing strips; Tampon applicators / tampons, Sanitary	3704	1.0%	3%

Supercategories, item type	Amount	% Amount	Amount as % of supercategory
Shopping bags, Plastic	3700	1.0%	3%
Other bottles, Plastic	3460	0.9%	2%
Other bags, Plastic	3280	0.9%	2%
Straws and stirrers, Plastic	3040	0.8%	2%
Balloons and balloon sticks	2723	0.7%	2%
Food containers inc fast food packaging, Plastic, Polystyrene	2715	0.7%	2%
Cup and cup lids, Plastic, Polystyrene, Paper/plastic	2618	0.7%	2%
Cutlery, Plastic	2597	0.7%	2%
Strapping bands, Plastic	2321	0.6%	2%
Shotgun cartridges, Plastic	2279	0.6%	2%
Sheets, industrial packaging, plastic sheeting	1493	0.4%	1%
Toys & party poppers, Plastic	1492	0.4%	1%
On-the-go food, drinks use, Paper/Plastic	1218	0.3%	1%
Pens and pen lids, Plastic	951	0.3%	1%
Caps and lids - other, Plastic	943	0.2%	1%
Cigarette lighters, Plastic	905	0.2%	1%
Other, unidentifiable packaging, Plastic	774	0.2%	1%
Shoes / sandals, Plastic, Rubber	761	0.2%	1%
Gloves, Plastic, Rubber	618	0.2%	0.4%
Mesh bags, sacks, Plastic	550	0.1%	0.4%
Medical / pharmaceuticals containers / tubes, Sanitary	497	0.1%	0.4%
Cartons / tetrapak (others), Paper/Plastic	474	0.1%	0.3%
4/6-pack yokes, six-pack rings, Plastic	398	0.1%	0.3%
Lolly sticks, Plastic	368	0.1%	0.3%
Wheels, tyres, belts, Plastic, Rubber	287	0.1%	0.2%
Tobacco pouches / plastic cigarette box packaging, Plastic	233	0.1%	0.2%
Crates and containers / baskets, Plastic	217	0.1%	0.2%
Combs/hair brushes/sunglasses, Plastic	214	0.1%	0.2%
Cartons / tetrapak milk, Paper/Plastic	203	0.1%	0.1%
Car parts, Plastic	185	0.0%	0.1%
Injection gun containers, Plastic	172	0.0%	0.1%
Other, packaging <100 items, Plastic	163	0.0%	0.1%
Plastic construction waste	141	0.0%	0.1%
Nappies, Sanitary	32	0.0%	0.0%
Other, SUP, non-packaging <100 items, Plastic	26	0.0%	0.0%
Subtotal	***141277***	***37%***	***100%***
NON-PLASTIC			
Bottles, Glass, Ceramic	4497	1%	10%
Bottle caps, Metal	2968	1%	6%

Supercategories, item type	Amount	% Amount	Amount as % of supercategory
Drinks cans, Metal	2760	1%	6%
On-the-go food, drinks use, Wood	969	0.3%	2%
Bags, Paper	195	0.1%	0.4%
Other packaging, Non-plastic	6456	2%	14%
Other, identifiable, Non-plastic	29014	8%	62%
Subtotal	***46859***	***12%***	***100%***
Fishing, PLASTIC			
Line, Rope, Chord, Plastic, Textiles	56333	15%	86%
Fishing net & pieces, Plastic	5659	1%	9%
Octopus/Lobster/Crab pots & tops, Plastic	177	0.0%	0.3%
Other fishing related, non-packaging, Plastic, Polystyrene, Rubber, Textiles	2310	1%	4%
Other fishing related, packaging, Plastic, Polystyrene	780	0.2%	1%
Subtotal	***65259***	***17%***	***100%***
Fishing, NON-PLASTIC			
Fishing items, non-packaging, Non-plastic	95	0.03%	90%
Fishing items, packaging, Non-plastic	11	0.00%	10%
Subtotal	***106***	***0.03%***	***100%***
UNIDENTIFIED			
Non-identifiable, Plastic, Polystyrene, Rubber	115281	31%	93%
Non-identifiable, Non-plastic	9047	2%	7%
Subtotal	***124328***	***33%***	***100%***
Grand total	377829	**100%**	

Finally, the contribution of fisheries and aquaculture related activities to marine litter is significant as around 17% of beach litter items found on beaches are likely to come from these activities. This is mostly as pieces of gear, boxes and bags for packaging fish and feeds, and personal protection equipment such as gloves and boots (the third of our above 3 categories to which both aquaculture and fishing contribute), when ALDFG (the other two categories to which only fishing is likely to contribute) are more likely to be found on the sea floor. However, fishing gear litter at beaches is a more ambivalent approximation for its total abundance than for SUP, seen that e.g. abandoned nets due to their density or entanglements are more likely to be prevalent on sea floors.

Table 4: Marine litter items – splits by fishing categories

Rank	General name	Items	% of all ML
1	String and cord (diameter less than 1cm)	48919	13,75%
1	Nets and pieces of net > 50cm	3499	0,98%
2	Tangled nets / cord	2108	0,59%
3	Nets and pieces of net < 50cm	1865	0,52%
4	Fishing line / monofilament (angling)	1351	0,38%

Rank	General name	Items	% of all ML
5	Mussel nets, Oyster nets	1142	0,32%
6	Floats/Buoys	478	0,13%
7	Rope, string and nets	243	0,07%
8	Tags (fishing and industry)	174	0,05%
9	Crab / lobster pots and tops	120	0,03%
10	Fish boxes	104	0,03%
11	Fish boxes - expanded polystyrene	68	0,02%
12	Fishing related (weights, sinkers, lures, hooks)	58	0,02%
13	Octopus pots	53	0,01%
14	Fishing line (entangled)	50	0,01%
15	Oyster trays (round from oyster cultures)	27	0,01%
16	Other fishing related	20	0,01%
17	Fish boxes - plastic	17	0,00%
18	Buoys	15	0,00%
19	Fish boxes	11	0,00%
20	Fishing net	11	0,00%
21	Foam buoys	11	0,00%
22	Fishing gear (lures, traps and pots)	10	0,00%
23	Lobster / crab pots	6	0,00%
24	Mesh bags (vegetable, oyster nets and mussel bags)	5	0,00%
25	Nets and pieces of net	5	0,00%
26	Fishing related (sinkers, lures, hooks, traps and pots)	4	0,00%
27	Crab / lobster pots	4	0,00%
28	Fishing Net Pieces	3	0,00%
29	Fish hook remains	2	0,00%
30	Octopus pots	2	0,00%
31	Fishing Buoys Pots Traps	1	0,00%

Around one third of the marine litter found cannot be identified in terms of its source, but it can be assumed that its source is broadly the same as the identified items.[26]

2.2 Methodological note on beach litter as a proxy for sea litter

Beach litter can arrive to the shore by: Transport from the sea, by tidal action, waves, currents; Dropping, loss on the beach; Transportation from land by run-off, rivers, wind or

[26] As always, whilst this is broadly reasonable there will be some items disproportionately unidentifiable. For example, wet wipes are moistened with some liquid and packaged so that they can be used to clean without availability of water. A reasonable assumption is that these are relatively quickly unidentifiable, as they will appear as pieces of paper (the basic material appears to be plain cellulose (paper)) if dried when flat lying, which is unlikely after use or in small clumps. So, whilst included under sanitary items, they may well be reported in other categories.

other relocation. Beach litter is therefore used not only as a proxy for what comes from the sea, but also for what can potential enter the sea (or affect marine species on the beach, also including the socioeconomic harm on tourism caused by littered beaches). The proportion of the three pathways (the third one presumably being of less importance) will depend much on the local situation including frequentation by visitors/tourists (littering locally) and the beach morphology (sand, gravel, slope, exposition). Note that most touristic beaches with regular (even daily) cleaning are not considered by the monitoring schemes.

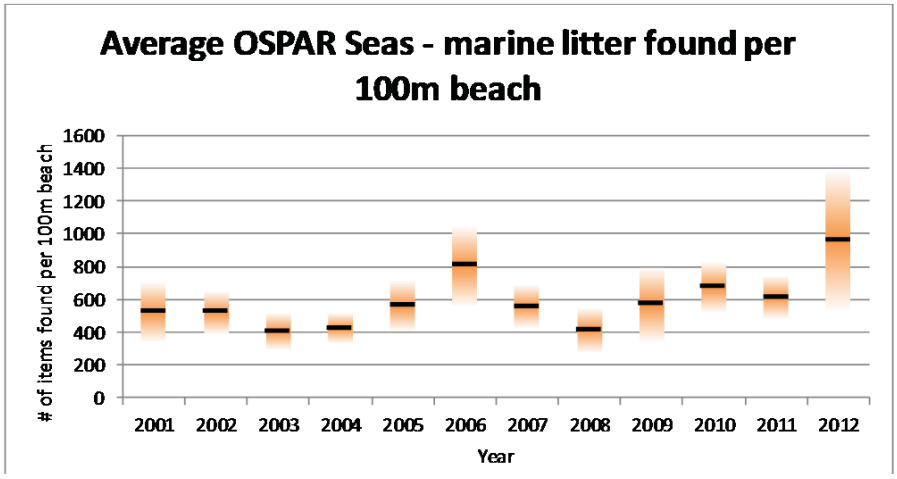
A general comment about beach litter data quality is that most of the data have been derived from observations and from clean-up events. There is now longstanding experience and the use and harmonisation of monitoring protocols has improved the situation. Still beach litter monitoring is not as precise as e.g. chemical contaminant measurements. The fate (and thus concentration) of litter items on the beaches depends on multiple factors, on top of the observer induced variability. This concerns e.g. wind (sweet wrappers can easily be blown away (and be blown back)), and visitor number (plastic items can be mixed under soft sand), etc., thus changing the observed items, while they can still affect the environment. Therefore this type of data can only be interpreted in a statistical distribution way and being aware of the variability[27].

For the sea surface harmonised methodologies are still being set-up. For seafloor litter data from International Bottom Trawling Surveys are available. The MSFD Technical Group on Marine Litter is working on the updating of the MSFD Guidance on litter monitoring[28].

2.3 Evolution of marine litter over time

Time series data from marine litter monitoring programmes (OSPAR, 2012) do not indicate a reduction of the amount of marine litter in European seas.

Figure 5: Marine litter found on European shores (number of items per 100m of coastline)



Source: OSPAR (in Panteia, 2015)

2.4 Categorisation of marine litter

Marine litter is usually categorised using the MSFD Master List Categories of Beach Litter Items that is the approach to provide a consistent identification of litter categories across

[27] JRC, 2016, Marine Beach Litter in Europe JRC 103929

[28] http://publications.jrc.ec.europa.eu/repository/bitstream/JRC83985/lb-na-26113-en-n.pdf

Europe. There are still different lists in use, some of them not easily comparable across all categories. The MSFD Technical Group is tackling that issue in its 2018 work programme. This sets out a number of types and their most prominent sources.

Table 5: Marine Conservation Society full list of litter items and attributed sources (MCS, 2013)

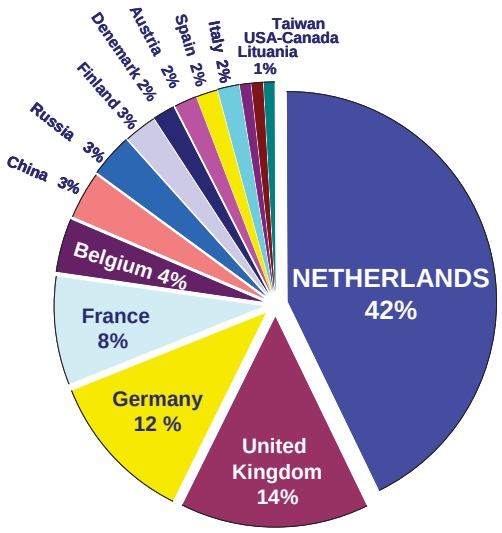
Public Litter:	4/6 pack yokes, plastic bags (including supermarket), plastic drinks bottles, plastic food containers, plastic toiletries bottles, plastic caps / lids, cigarette lighters / tobacco pouches, combs / hair brushes / sunglasses, crisp / sweet / lolly / sandwich wrappers, cutlery / trays / straws / cups, pens, plastic shoes / sandals, shotgun cartridges, toys / party poppers / fireworks / dummies, polystyrene fast food containers / cups, balloons / balloon string, clothing / shoes / beach towels, disposable barbecues, metal bottle caps, metal drink cans, foil wrappers, household batteries, animal faeces in bags, animal faeces not in bags, paper bags, cartons / tetrapak (e.g. fruit juice), cigarette packets, cigarette stubs, paper cups, newspapers / magazines, corks, ice lolly sticks / chip forks, glass bottles, glass pieces.
Fishing:	Fish boxes, fishing line, fishing net and net pieces <50cm, fishing net and net pieces >50cm, floats (fishing buoys) / reels, plastic lobster / crab pots and tops, string and cord diameter <1cm, polystyrene buoys, polystyrene fish boxes, rubber boots, heavy duty gloves, tyres with holes, fishing weights / hooks / lures, metal lobster / crab pots and tops, wood lobster / crab pots and tops.
Sewage-Related Debris:	Condoms, cotton bud sticks, nappies, tampon applicators / tampons, toilet fresheners, towels / panty liners / plastic backing strips, wet wipes, other sanitary items.
Shipping:	Plastic cleaner bottles, foreign plastic bottles, plastic oil bottles, industrial packaging / crates / sheeting, mesh bags (e.g. vegetable), Rope diameter >1 cm, strapping bands, aerosol cans, metal food cans, oil drums, cartons / purepak (e.g. milk), pallets / crates, light bulbs / tubes.
Fly Tipped:	Traffic cones, tyres without holes / wheels, cloth furnishings, car parts / car batteries, scrap metal / appliances / paint tins, pottery / ceramic.
Medical:	Inhalers, plasters, syringes, other medical items.
Non-Sourced:	Plastic pieces <2.5cm, plastic pieces >2.5cm, other plastics, fibreglass, foam / sponge / insulation, polystyrene packaging, polystyrene pieces <50cm, other polystyrene items, light weight gloves, rubber pieces <50cm, other rubber items, cloth pieces, sacking, other cloth items, wire / wire mesh / metal pieces, other metal items, cardboard, other paper items, paint brushes, wood pieces (not twigs), other wood items.

2.5 Travelling of marine litter

It is common to ask where the litter found on a particular beach has come from. This can be estimated using labels and bar-codes on litter, which provides information on the country of production, the manufacturer, the product type and the age of litter items. However, labels can be lost or become illegible and only items with a label or bar-code (not items like cigarette butts or cotton-bud-sticks) can be included in the analysis and sometimes the bar code could be misleading (bought in one country, discarded in another). Therefore, this type of information should be analysed with caution.

Van Franeker (2005) categorised items found on a beach clean in Texel in the Netherlands to a country of origin. The majority of items originated from the Netherlands or neighbouring regions, indicating that this method can be used to provide information on the likelihood of litter items originating form given sources as well as on their geographical origin (see below).

Figure 6: Proportions of countries of origin as derived from barcodes or label information on litter items found on Texel, April 2005 (translated from van Franeker, 2005)



2.6 Marine litter aggregation – creating a 'top 10'

2.6.1 General data

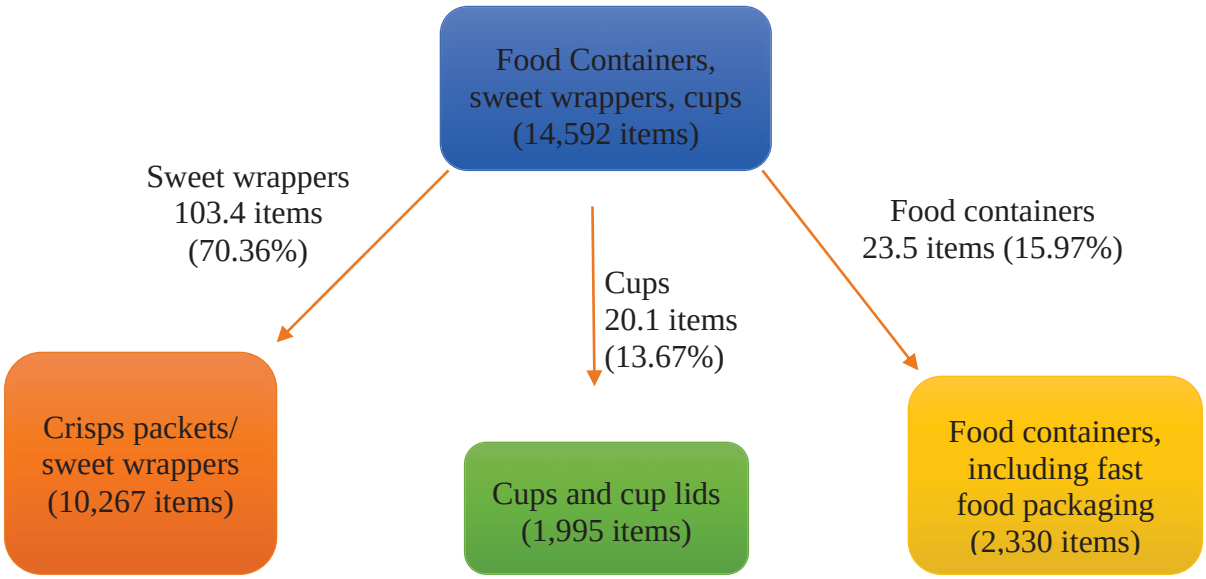
The MSFD Master List Categories of Beach Litter Items is highly detailed. This makes sense for identifying what is on beaches, but it makes less sense from a policy perspective. For this reason, categories that are very similar have been grouped together (aggregated).

The JRC Technical Report: Top Marine Beach Litter Items in Europe lists marine litter items collected in 2016. The JRC list identifies 251 different types of litter and a total of 355,744 items. First, as the list does not identify plastics specifically, or single-use items, the list was divided into plastic, non-plastic and fishing items. Plastic items were then assessed as single-use or non-SUP.

As countries and regions have adopted different methods, there is significant over-lap between some categories (such as "4/6-pack yokes, six-pack rings" and "4/6-pack yokes, six-pack rings/bags/shopping bags including pieces/small plastic bags, e.g. freezer bags including pieces") and some items could potentially be listed in a number of categories.

The JRC list was then used to compile a shorter list of discrete classifications that provide the relative contributions of items that are alike in terms of source, use or material and are generally under the domain of a defined policy area. From the JRC list, 31 SUP categories were disaggregated so that the items could be re-allocated to different groups. For example, "Food containers, sweet wrappers, cups" was divided into: "Food containers including fast food packaging"; "Cups and cup lids"; and "Crisps packets/ sweet wrappers", as illustrated below.

Figure 7: The disaggregation of "Food containers, sweet wrappers, cups"



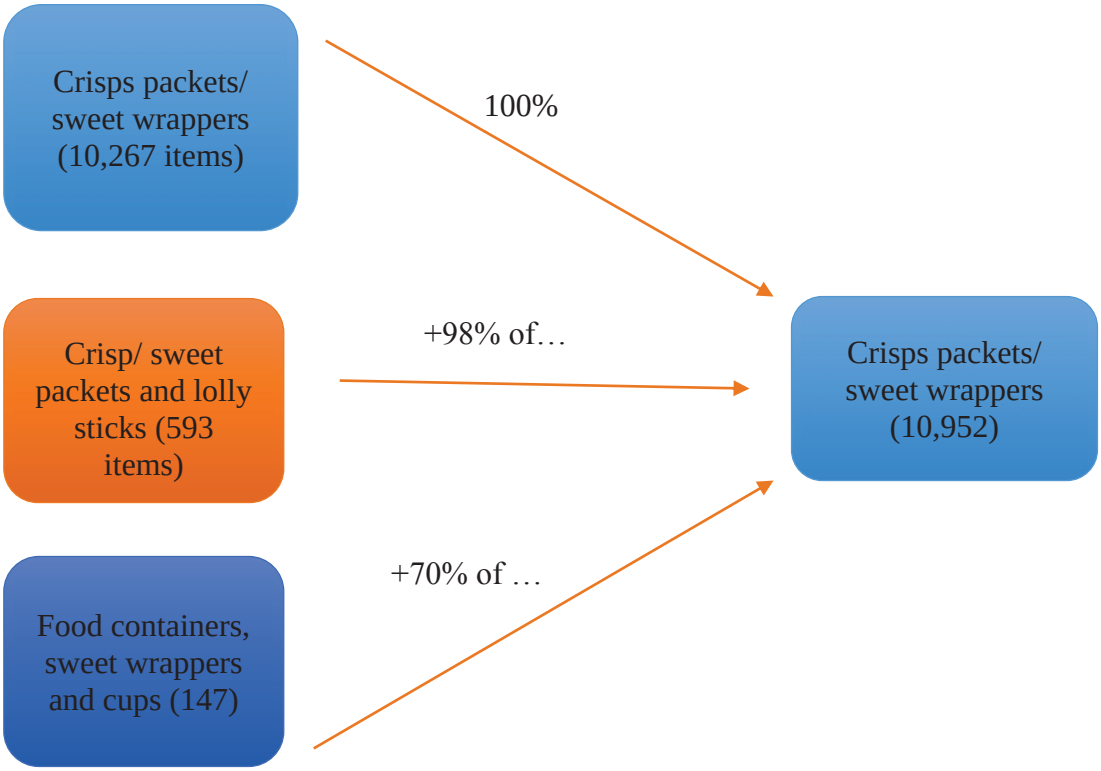
The process for apportioning the items affects the final rankings and there is no completely objective way to do this. The method adopted ensures that the top ten items reflect an accurate assessment of the data collected from the disparate studies, without misrepresenting the prevalence of any given item.

The items were disaggregated proportionally, based on the compositions of other categories with similar items. For example, food containers were known to account for 16% of the total number of original items in the three categories "Food containers, sweet wrappers and cups", therefore were disaggregated (2,330 out of 14,592). It was assumed that 16% of those 147 items were food containers and 23.5% were re-allocated to "food containers, including fast food packaging".

Once the broader groupings had been disaggregated into the most relevant specific category, they were aggregated into similar categories and those where, for the purpose of this analysis, it was not important to distinguish between relatively similar items. Considering material composition, manufacturing, usage and policy approach, for instance, it was not considered necessary to distinguish between crisp packets and sweet wrappers. Conversely, sweet wrappers and food containers are qualitatively different, so are split. Similarly, beverage bottles were disaggregated from other types of plastic bottle.

This process generated 17 classifications of SUP, representing 141,277 units; **Figure 8** illustrates the composition of one of these 17 classifications.

Figure 8: The aggregation of "Crisps packets/ sweet wrappers"



The table below lists the top ten items following the disaggregation and aggregation process. The complete list, including a full breakdown of the categories contributing to the top ten and the proportions allocated, is included in Annex 1 (Eunomia report).

The table demonstrates that by focussing on these items, potentially 77% of the general plastic items found on beaches can be addressed by the measures proposed; while a full 86% of the single-use plastic items that are found on beaches could be addressed.

Table 6: Top ten SUP Items

Ranking	Item	Total Number on sample of beaches monitored in 2016	% as proportion of general plastic items[1]	Cumulative % of items in scope as a proportion of general plastic items[1]	% as proportion of single-use plastic items[2]	Cumulative % of items in scope as a proportion of single-use plastic items[2]
1	Drinks bottles, caps and lids	24,541	19%	19%	21%	21%
2	Cigarette butts	21,854	17%	36%	19%	39%
3	Cotton buds sticks	13,616	11%	46%	12%	51%
4	Crisp packets/ sweet wrappers	10,952	9%	55%	9%	61%

Ranking	Item	Total Number on sample of beaches monitored in 2016	% as proportion of general plastic items[1]	Cumulative % of items in scope as a proportion of general plastic items[1]	% as proportion of single-use plastic items[2]	Cumulative % of items in scope as a proportion of single-use plastic items[2]
5	Sanitary applications	9,493	7%	62%	8%	69%
6	Plastic bags (CBD & non-CBD)	6,410	5%	67%	6%	74%
7	Cutlery, straws and stirrers	4,769	4%	71%	4%	79%
8	Drinks cups and cup lids	3,232	3%	73%	3%	81%
9	Balloons and balloon sticks	2,706	2%	75%	2%	84%
10	Food containers incl. fast food packaging	2,602	2%	77%	2%	86%

[1] *"General plastic items" – is the group of items excluding non-identifiable items such as fragments, non-plastic items, and items associated with fishing and aquaculture.*

[2] *"Single-use plastic items -– is the group of items excluding non-identifiable items such as fragments, non-plastic items, items associated with fishing and aquaculture, and non-single-use plastics.*

Some understanding of the aggregation groups is needed. For example, Sanitary applications are a fairly aggregated category, and comprise a number of different items:

- Wet wipes
- Sanitary towels/ panty liners/ backing strips;
- Sanitary (nappies, cotton buds, tampon applicators, toothbrushes);
- Tampons and tampon applicators;
- Other (e.g. diapers, toilet paper, tissue paper, shaving razors);
- Toilet fresheners;
- Syringes/ needles; and
- Condoms (including packaging).

This list is based on the MSFD or OSPAR category codes, where wet wipes is not a separate category. The UK and the Republic of Ireland are the only locations where the frequency of wet-wipes is recorded as a specific category. The data comes from parallel monitoring efforts – the Great British Beach Clean (run by the Marine Conservation Society – MCS) in the UK and the Clean Coasts Big Beach Clean in the Republic of Ireland. These produced the following statistics:

- UK – wet wipes are 45% of sanitary items. When cotton buds are separated out (as our analysis for the top ten does), they constitute 80% of sanitary items; and
- Republic of Ireland – wet wipes are 51% of sanitary items. Excluding cotton buds, they are 72% of sanitary items.

None of the other nations collect litter data on wet wipes as a distinct category. However, they may well be a dominant part of this category.

Table 7: Additional ranked SUP items

Ranking	Item	Total Number on sample of beaches monitored in 2016	% as proportion of general plastic items[1]	Cumulative % of items in scope as a proportion of general plastic items[1]	% as proportion of single-use plastic items[2]	Cumulative % of items in scope as a proportion of single-use plastic items[2]
11	Shotgun cartridges, Plastic	2263	2%	79%	2%	88%
12	Strapping bands, Plastic	2239	2%	81%	2%	90%
13	Cigarette lighters, Plastic	795	1%	82%	1%	91%
14	4/6-pack yokes, six-pack rings, Plastic	372	0%	82%	0%	91%
15	Lolly sticks, Plastic	216	0%	82%	0%	91%
16	Tobacco pouches / plastic cigarette box packaging, Plastic	148	0%	82%	0%	91%
17	Nappies, Sanitary	21	0%	82%	0%	91%

[1] *"General plastic items" – is the group of items excluding non-identifiable items such as fragments, non-plastic items, and items associated with fishing and aquaculture.*

[2] *"Single-use plastic items –– is the group of items excluding non-identifiable items such as fragments, non-plastic items, items associated with fishing and aquaculture, and non-single-use plastics.*

2.6.2 Regional seas data

Findings vary to some extent across Europe depending on region (and indeed vary by beach within a given region):

- North-East Atlantic: Maritime activities – fishing, commercial shipping, ferries and cruise shipping, leisure boat traffic, offshore installations and aquaculture facilities – and land-based tourism and recreational activities account for about 80 per cent of waste input. Other sources include discharges from municipal waste through rivers and canals, and solid waste from industrial facilities, dumpsites or sewage systems near the coast.
- Baltic Sea: The majority of the finds can be traced to consumer waste, with a relatively high share of household goods and equipment associated with tourism (including toiletries). Its input path is rivers and coastlines. The greatest sea-based source of input is the fishing industry.
- Mediterranean Sea: Land-based sources account for the majority: about 40-50 per cent of litter input owes to tourism, with volumes rising significantly during the holiday season. An estimated additional 40 per cent consists of household items (including toiletries). In

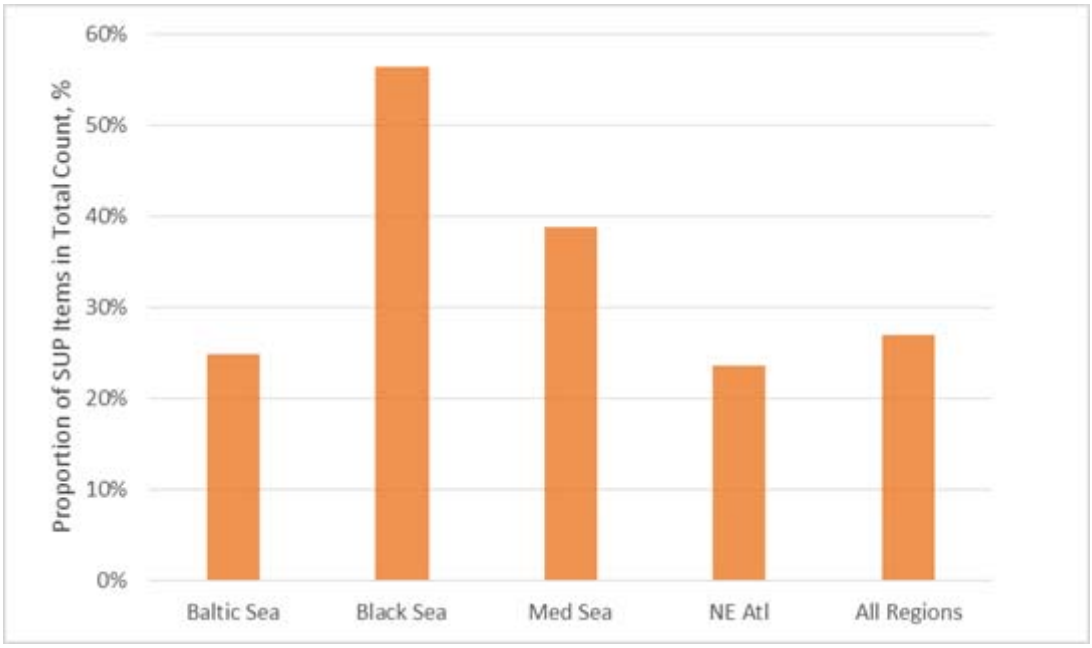
addition to inputs from the fishing industry, cigarette butts are also present on a substantial scale along the Mediterranean.

- Black Sea: Relatively little data is available, and the results of investigations differ both regionally and locally. Some data points to municipal waste which is discharged in sewage, e.g. from poorly managed dumpsites, as a dominant factor. Next are inputs from maritime transport, ports and coastal tourism. Investigations at beaches near Constanta in Romania, however, indicate that the main local source of input is tourism (inland and coastal), followed by part-time fisheries. Many household items (including toiletries) are also found. Illegal fishing activities are also identified repeatedly as a major source.

Analysis of top 10 by regional sea

The regional data was analysed to understand whether the problem appeared to be constrained to certain areas of the EU or whether it was wide spread. The total counts vary significantly by sea, related to the length of coastline and number of surveys. It is clear that the Black and Mediterranean Seas have higher incidences of SUP items in the beach counts.

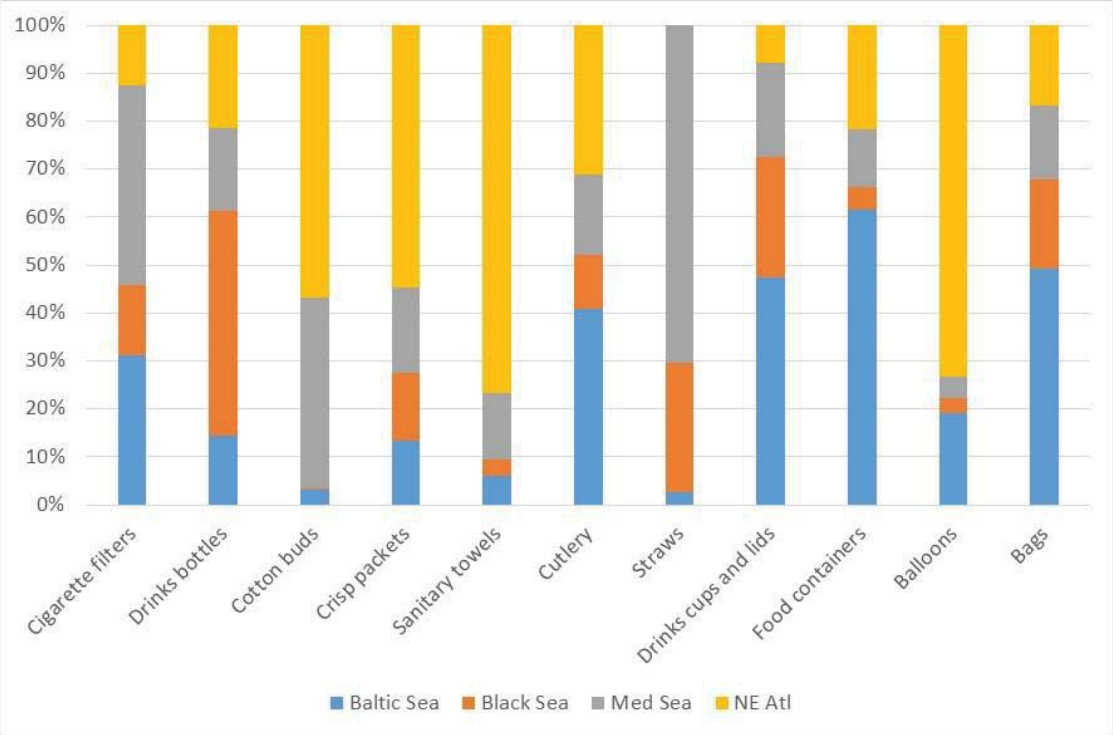
Figure 9: Proportion of top 10 items in total beach litter counts



Secondly, the relative shares of the key items vary by sea but all items are present in all seas. The supposed lack of straws in the NE Atlantic is a factor of the categorisations, rather than an absence of the items.

Whilst distributions vary, the top 10 categories account for a large proportion of SUPs in each sea, but with variation in the rankings (so what is first somewhere, may be 5th elsewhere but there is no evidence that as a grouping the top 10 does not seem reasonable prioritisation in each sea). The regional seas analysis, therefore, suggests that the top ten list above is suitable for analysis in this Impact Assessment.

Figure 10: Relative shares of key items by sea

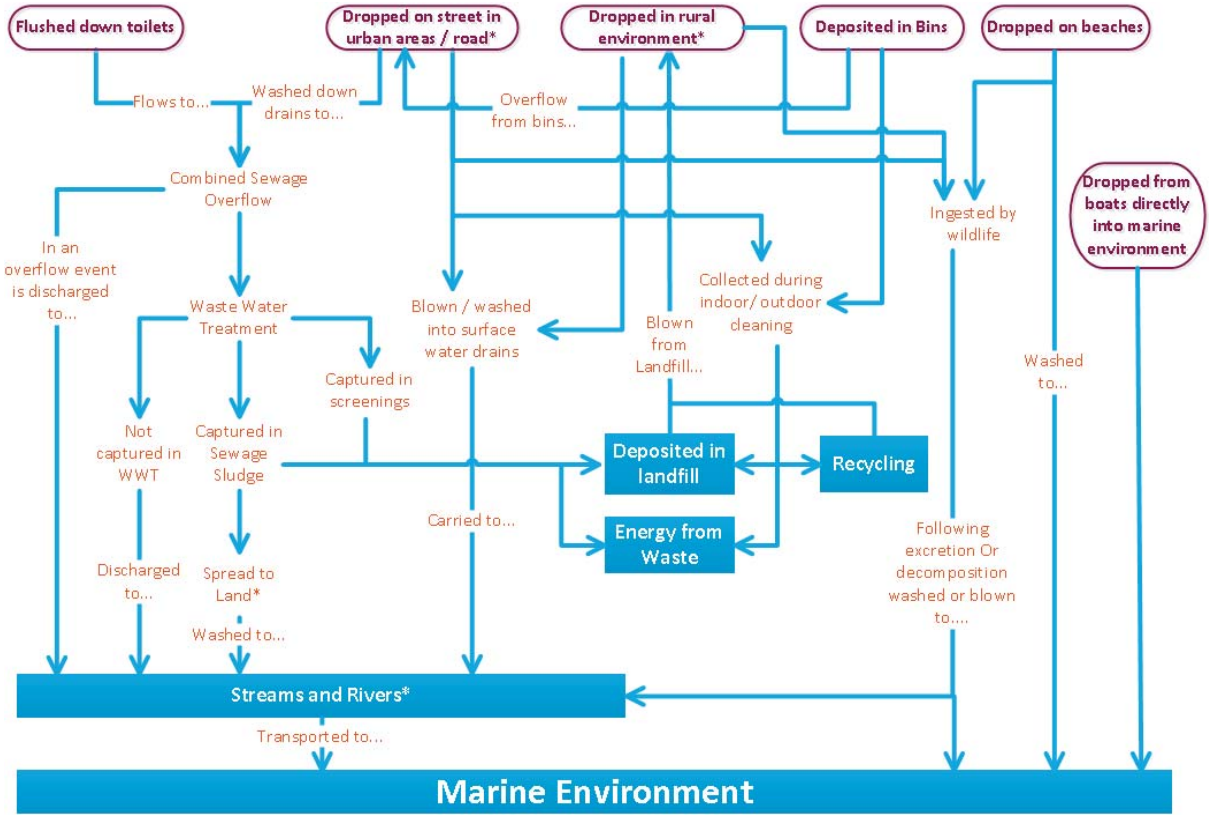


2.7 Pathways for marine litter

In general terms, the key pathways for the SUP items to reach the marine environment, are:

- Consumers drop litter on the ground in the urban or rural environments. This is to some extent due to the lack of convenience of the alternative, i.e. responsible management, but also the lack on incentives, economic or otherwise, to do the right thing. Many consumers will do the right thing, but a section of society is either unaware or uncaring of the consequences of dropping litter; and
- Consumers flush items down the toilet or drains (e.g. cotton buds, wet-wipes and sanitary towels). The driver in this instance is somewhat convenience but potentially more weighted towards perceived health risks from dealing with soiled sanitary items, or from the assumption that they will be properly treated in the sewerage system (ie few people understand that a flushed cotton bud stick may end up in the sea).

Figure 11: SUP pathways



The following table looks at this more closely for specific items, and elaborates the transport mechanism and sources.

Table 8: Examples of sources, means of release, geographic origin, pathways and transport mechanism for a few marine litter items found on the Northern coast of Germany[29]

	Source	Means of release	Geographic origin	Pathway	Transport mechanism
COTTON BUD STICKS	Consumers / General Public	Improper disposal down the toilet	Households	Sewage systems and/or rivers	Sewage, rivers, ocean currents and tides
PLASTIC BAGS	Coastal tourism & recreation	Littering (e.g. on beach)	Local (e.g. coastal town or beach nearby)	Direct entry (beach) or e.g. windblown (if town nearby)	Wind and tides
	Consumers / General Public	Littering (e.g. on street, from car, in natural area)	e.g. Distant (inland town)	Distant - Wind (blown) and/or rivers	Wind, rivers, ocean current and tides
	Waste management at	Overflowing open bin	Beach	Direct input	Wind, tides and currents

[29] Source: JRC Technical Report, Identifying Sources of Marine Litter, 2016

	beach				
NETS AND PIECES OF NETS	Fisheries	Discard or unintentional loss over board during net repair work at sea	E.g. Local fisheries, regional fisheries or distant fisheries	Direct entry - nets get washed or thrown overboard	Winds(drift), currents and tides
	Fisheries	Loss of nets and pieces of net during fishing (snagging)	E.g. Local fisheries, regional fisheries or distant fisheries	Direct entry - nets get snagged on wrecks, rocks etc. ripped off pieces of net remain attached to objects underwater or are released into the water column (ghost nets)	Winds (drift), currents and tides
	Fisheries and/or harbours	Discard or unintentional loss during net repair work on land or/and runoff from harbours	E.g. local fishing harbours	Direct entry - nets washed, blown or thrown (swept) into harbour basins and washed out to sea	Winds (blow-off), tides and currents
INJECTION GUN CARTRIDGE (Grease)	Shipping including fisheries	Discard or unintentional loss overboard at sea	Local (cartridges recorded on beaches are not fouled, not battered)	Direct entry from ships at sea	Winds (drift), currents and tides
TAHITIANS (Plastic sheeting to protect mussel cultures)	Aquaculture	Unintentional loss or discard after use	Distant – International - Northwest France/Atlantic coast of France	Direct input	Winds, currents and tides

2.8 Sea and land based split of marine litter

Attributing marine litter to different land and sea based sources is a challenge. Litter on the beach is the easiest to count and use for monitoring, but in many cases could be attributed either to land or sea based sources with different degrees of probability. Also, beach litter as discussed above, is an imperfect indicator and it is acknowledged that some items will be disproportionately found on beaches.

For example, a study by Sá et al (2015) finds evidence that significant higher concentrations of waste float near dense shipping routes (operational waste and packaging material),

compared to the areas with little shipping traffic, indicating the contribution of the (merchant) shipping sector to waste at sea.

For the fisheries sector, more specific estimates exist in relation to fisheries equipment, including so-called abandoned, lost or otherwise discarded fishing gear (ALDFG), ranging up to 220,000 tons per year for the EU as a whole (calculations based on Eunomia, 2016). Data from fishing for litter programmes initiated over the past decade suggest that the amount of ALDFG is gradually decreasing, but still a lot of 'old' ALDFG is in Europe's seas. ALDFG is to be passively fished and delivered to port, which is supported by fishing for litter programmes or independently.

Plastics are the most abundant debris found in the marine environment and comprise more than half of marine litter in European Regional Seas. Figures estimated point at 54,000 to 145,000 tonnes of plastic per year entering the marine environment from land-based sources (Eunomia, 2016). Visual surveys and surface trawls indicate a stock of plastics floating near the surface to be in the order of 268,000 tons, to which European seas are accounting at least 30% (Five Gyres Institute, 2014 as reported in Eunomia, 2016). These figures do not take into account plastics that sink or to microplastics that cannot be visually observed, indicating that the overall stock of plastics in the marine environment is significantly larger.

Analyses of the *origins of marine litter* found in European seas and on shore indicate that a substantial part originates from ships, but various sources use different estimates, caused by different measurement methods.

Table 9: Share of marine litter from sea based sources

Source	Baltic Sea	North East Atlantic	Mediterranean	Black Sea	EU average
Ocean Conservancy (2012) – waste count		20%			12%
Idem, weight corrected (Eunomia, 2016)					32%
Arcadis (2012)	18%	48%	16%	50%	34%
Of which fishing sector	51%	88%	58%	48%	65%
Of which other shipping	49%	12%	42%	52%	35%

Eunomia (2016) discusses the limitations of data and methods applied by Ocean Conservancy and Arcadis, and, also referring to other sources (Van Franeker et al., 2010 and Ioakeimidis et al., 2014), assumes a general split of 20-40% of marine litter being derived from sea-based sources.

2.9 Riverine and soil litter

There are clearly close links between marine and riverine litter, with the latter usually ending up in the former. Efforts to reduce marine litter through prevention will generally lead to a reduction of litter found on land (in soil) or in rivers. JRC analysis of litter found in rivers provides evidence of this link, with similarities between the incidence of different types of

litter in rivers and found on marine beaches. Analysis of floating macro litter from 52 rivers found 8,599 items with following frequency distribution.[30]

Table 10: Types of litter found in rivers

Ranking	Items	% of total items
1	Plastic pieces	38.59%
2	Plastic bottle	9.55%
3	Cover / packaging	8.42%
4	Bag	7.77%
5	Polystyrene pieces	6.35%
6	Other paper	4.01%
7	Paper packaging	3.61%
8	Sheets	2.93%
9	Foam	2.70%
10	Cans	2.05%
11	Other plastic/polystyrene items	1.98%
12	Plastic container	1.81%
13	Other metal	1.48%
14	Newspapers & magazines	1.19%
15	Beams / Dunnage	0.99%
16	Other rubber	0.95%
17	Wood boards	0.72%
18	Synthetic rope	0.71%
19	Other textiles	0.57%
20	Pallets	0.48%
21	Balls	0.47%
22	Fish boxes - polystyrene	0.47%
23	Clothing	0.40%
24	Rubber boots	0.24%
25	Rope / string and nets	0.22%
26	Fish boxes - plastic	0.21%
27	Buoys	0.21%
28	Gloves	0.17%
29	Sails / canvas	0.13%
30	Fishing net	0.13%
31	Barrels	0.12%
32	Balloons	0.10%
33	Carpet & Furnishing	0.10%
34	Wire	0.08%
35	Tyres and belts	0.06%
36	Crates	0.02%
37	Fishing related	0.02%
38	Other litter	0.01%

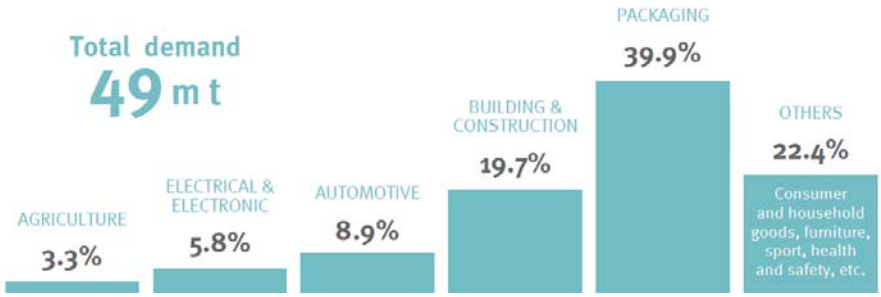
2.10 Plastics overview

A plastic material is an organic solid, essentially a polymer, i.e. chain of several thousand of repeating molecular units of monomers, or combination of polymers. The monomers of plastic are either natural or synthetic organic compounds. The term resin is sometimes used as synonym of a commercial polymer[31].

[30] See JRC Technical Report "Riverine Litter Monitoring - Options and Recommendations", 2016 for an overview discussion.
[31] Source: Plastics Europe

Within Europe, plastics are primarily used in packaging (40%), while the building sector is the second user (20%). Automotive, electrical & electronic and agriculture are the three other sectors with significant plastic use, as explained in the following figure.[32]

Figure 12: Distribution of European (EU-28+NO/CH) plastics demand by segment in 2015[33]



Plastics are traditionally derived from fossil sources, mainly oil and gas. Plastics can also be made of alternative feedstock such as renewable resources currently mainly derived from different types of agriculture (biomass), organic waste and residues, gaseous effluents (e.g. CO_2). And finally, plastics can also be made from secondary materials obtained through the chemical or mechanical recycling of collected plastic waste.

In Europe 57 million tonnes of primary plastics were produced in 2016, the share of bio-based plastics being 0.5 and 1% of EU annual plastic consumption. The European plastics industry is a big part of the chemicals industry and plays a vital role in the EU economy. It employs about 1.45 million people and has a turnover of 350 billion (including plastic converters and technology providers).

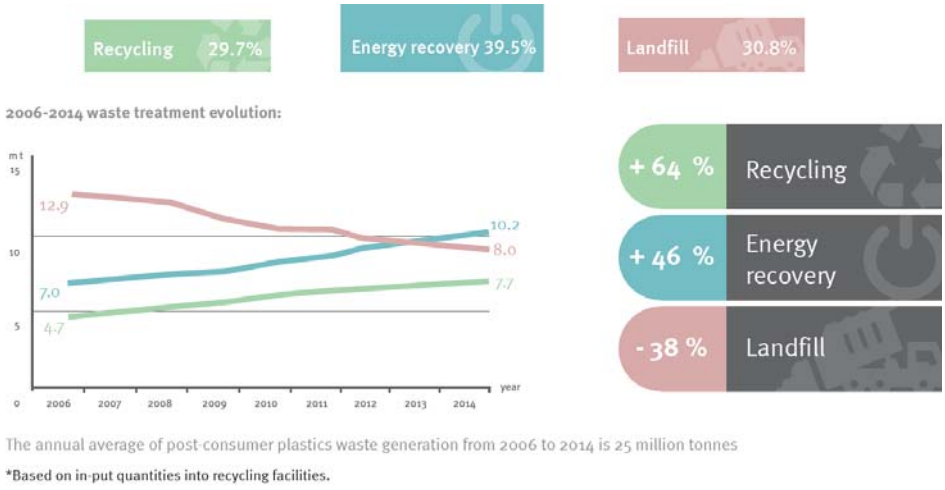
Plastic often follows a "take-make-consume-dispose" pattern of lifecycle. It is commonly agreed that this type of model does not correspond to a sustainable growth principles in a sense that it is based on the assumption that resources are abundant, available, easy to source and cheap to dispose of. Strained natural resources and climate change are however becoming an ever more tangible reality. Therefore, a model that is circular has become necessary in order to keep the added value in products for as long as possible and eliminate as much as possible waste generation. The circular economy model acknowledges that resources are limited and should be used in an efficient way.

In 2014, the EU generated about 25 million tonnes of post-consumer plastic waste of which only 30 % was recycled. The performance as regards recycling of plastics wastes, although in progress, shows there is ample room for improvement. For example, the current target for recycling of plastic packaging waste is 22.5%. The average recycling rate of plastic packaging waste being 39.8% in 2015[34] clearly demonstrates that this target is obsolete. A more ambitious target was needed to provide incentives for increasing recycling; hence the recently proposed amendment to the Packaging and Packaging Waste Directive (55% of plastic packaging waste to be recycled by 2025).

[32] http://www.plasticseurope.org/documents/document/20161014113313-plastics_the_facts_2016_final_version.pdf
[33] Source: Plastics Europe (2016). Plastics - the Facts 2016

[34] Source: Eurostat: http://ec.europa.eu/eurostat/statistics-explained/index.php/Packaging_waste_statistics

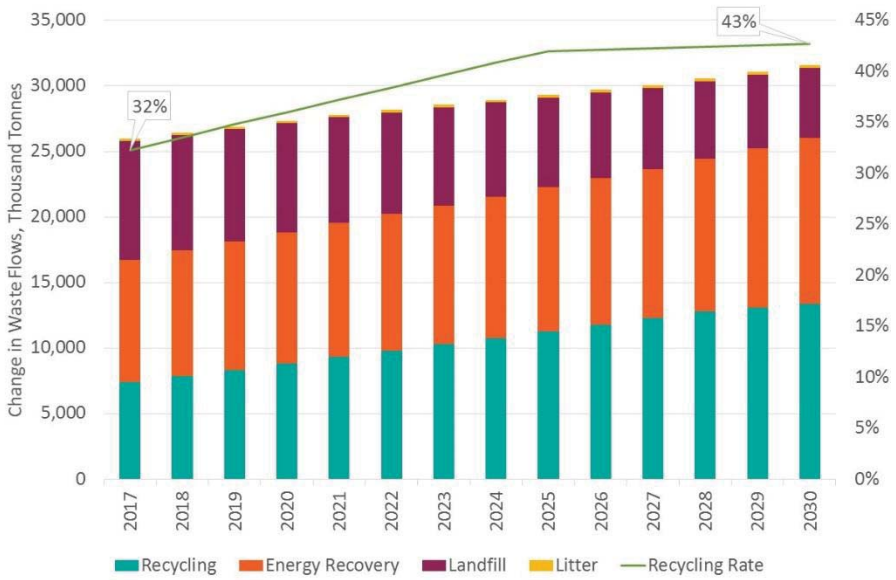
Figure 13: Waste treatment evolution 2006-2014[35]



Once plastic wastes are considered as a resource to be kept as long as possible in the value chain the lifecycle should be modified accordingly.

In terms of the management of plastic wastes, it is estimated that around 32% are currently recycled, with this projected to increase to 43% in 2030 as a result of the baseline policies taking effect: the baseline includes the European Commission's proposed revisions to the Waste Framework Directive and waste stream Directives, which, at the time of writing, have been agreed between the co-legislators.

Figure 14: Overall EU-28 Plastic Waste Flows[36]



Littering rates appear small in relative terms, but this still amounts to more than 200 thousand tonnes of plastic entering the environment, including the marine environment, each year by

35 Source: Plastics Europe (2016). Plastics - the Facts 2016

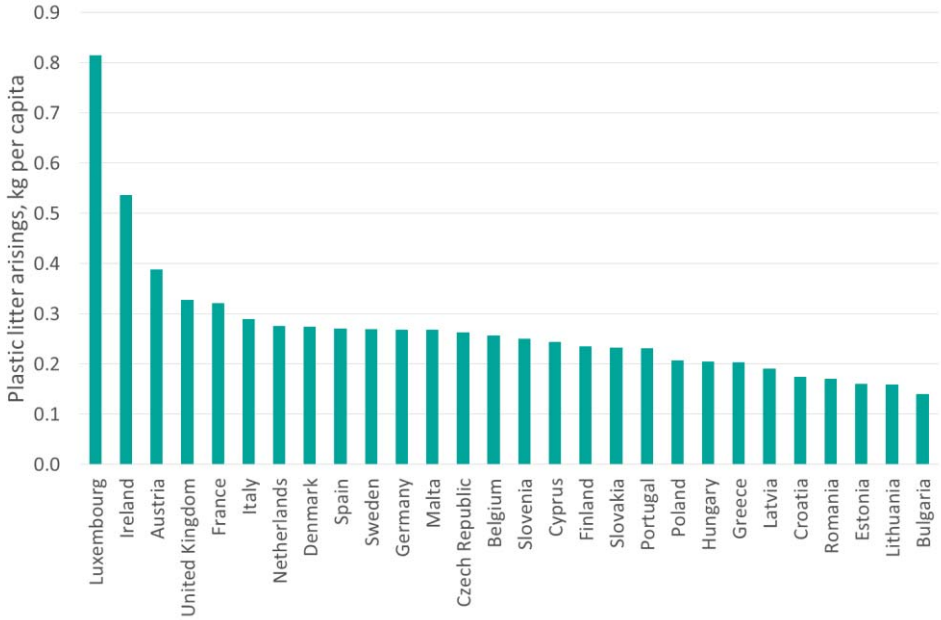
36 Source: Eunomia waste flows model, data sources by sector

2030. Once again, the basis for this estimate is such that limited confidence can be attached to the estimate.

2.11 Plastic litter estimates

It is estimated that a total of 139 thousand tonnes of plastic packaging litter are generated in the EU-28 each year, of which 41 thousand tonnes are beverage bottles. The arising of plastic packaging litter in each Member State (normalised by total population) are shown below.

Figure 15: Arising of Plastic Packaging Litter by Member State in 2014, kg per capita



2.12 Waste from fishing gear

Plastic products are common in the fishing and aquaculture sectors. Aquaculture is distinguished from the fishing sector by the fact that fishing involves actively or passively catching wild fish and shellfish species; while in aquaculture, the species are farmed in enclosures or on structures that are tethered. These industries are reliant on plastic material to provide affordable, lightweight and durable equipment. Various types of plastic are utilised for different types of gear and equipment; an overview is given below.

Table 11: Overview of plastic types utilized in fishing and aquaculture gear

Material	Use
Nylon (Polyamide)	Nets (mostly gillnet and seine nets), lobster and crab pots
Polypropylene	Nets (mostly gillnet and trawl net), rope, mesh
Polyethylene	Nets (mostly trawl net, purse seine net); longlines; Aquaculture: rope, cage, floats, tubes, disks
HDPE	Trawl doors, dredges, small parts and cladding
Polystyrene, Polyurethane	Insulation, floats and buoys, including in fish aggregation devices (FADs)
PVC	Aquaculture: cages, tubing and piping
Acrylonitrile butadiene styrene (ABS), Polyvinyl difluoride (PVDF)	Aquaculture: valves

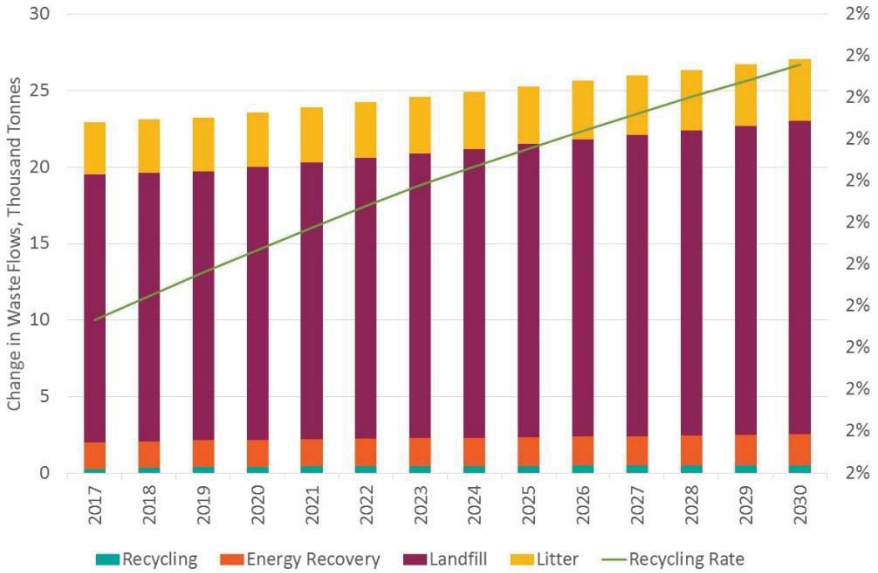
Aramids, Ultra High MW Polyethylene, Aromatic polyester	Rope, net (newer technology)
GFRP (glass fibre reinforced plastic)	Aquaculture (newer technology)

There are few estimates of plastic waste generation in the fishing and aquaculture sector and only partial data on the annual consumption of plastics by the sector. The amount of fishing gear that is abandoned, lost, or discarded at sea is only roughly estimated. An analysis based on the PRODCOM database and reports of what is found at sea is presented in annex 7.

Recycling rates are based on data from NoFir's EU-wide recycling programme, EUFir.[37] This is the only recycling programme to the Commission's knowledge that operates in the EU. Countries, which are not currently involved in the scheme, have been given a nominal recycling rate of zero. This yields an EU-wide recycling rate of around 1.5%. Residual treatment destinations were based on information from a Norwegian study[38], which indicated that little netting ends up in incinerators, as they are not usually equipped with net handling gear or adjusted for such high-calorific feedstock. Therefore the majority of gear has been allocated to landfill (76%), with a smaller proportion (8%) to incineration.

Future waste generation projections were based on historic trends in fishing and aquaculture production. Overall waste growth across the EU-28 is projected to increase by 298 tonnes per year from 2015 onwards, equivalent to 1.6% of total waste arising in 2015. The recycling rate is envisaged to remain relatively static, with little growth over time, in the absence of a more co-ordinated effort to fund and increase recycling in the sector EU-wide. The littering rate is held to be likely to remain constant, if no action is taken; and landfill and incineration rates also to remain relatively unchanged.

Figure 16: Summary of baseline waste flows for fishing gear plastics



[37] https://nofir.no/

[38] p57, Table 11 Mepex (2013) Økt utnyttelse av ressursene i plastavfall (Increased utilization of resources in plastic waste), Report for Klima - og forurensningsdirektoratet (Norwegian Climate and Pollution Agency), March 2013

2.13 Impacts on the environment, health and economy

Once in the environment - particularly in the marine environment - plastic waste can persist for hundreds of years. The 10 million tonnes of litter, mostly plastic, which ends up in the world's oceans and seas annually, turning them into the world's biggest plastic dump[39], harm the coastal and marine environment as well as aquatic life.

Marine litter causes enormous harm to ecosystems : impacts include mortality or sub-lethal effects on plants and animals through entanglement[40] (e.g. from ghost nets[41]) physical damage, smothering, ingestion of plastic by animals such as turtles or birds, including microplastics; these microplastics have the potential to accelerate accumulation of chemicals throughout the food chain, with potential negative impacts on human health. Furthermore, marine litter facilitates the invasion of alien species, altering benthic community structure[42]. Most plastic debris eventually comes to rest on the seabed[43].

The number of species known to be affected by the marine litter are now almost 800, the proportion of cetacean and seabird species has risen to 40% and 44% respectively, while some surveys show that 100% of turtles are affected by ingestion of litter. A recent technical report from JRC provides insight about the major negative impacts from marine litter by describing the mechanisms of harm[44].

Microplastics are ubiquitous and reach even the most remote areas[45] with a concentration in water sometimes higher than that of plankton. These micro plastics, and the chemical additives they contain, if ingested in large quantities by marine fauna may have a high potential for contaminating the food chain through predator-prey interaction.

Plastic is not inert. Conventional plastic contains chemical additives which can be endocrine disruptors, carcinogenic or provoke other toxic reactions and can, in principle, migrate into the environment, though in small quantities[46,47]. Persistent organic pollutants (POPs), such as pesticides like DDT and polychlorinated biphenyls (PCBs)[48] since 1970s have been progressively banned but, as they are very persistent in the environment and sometimes still present in some materials or products in use, their presence can still be detected. They can attach themselves from the surrounding water to plastic fragments which can be harmful[49] and

[39] Wurpel G.,Van den Akker J.,Pors J., Ten Wolde, Plastics do not belong in the ocean. Towards a roadmap for a clean North Sea. IMSA Amsterdam (2011), p. 13.
[40] UNEP, 2009, Marine Litter: A global challenge, http://www.unep.org/pdf/unep_marine_litter-a_global_challenge.pdf
[41] A phenomenon by which large lumps of derelict fishing nets float in water, unintentionally catching large amounts of fish.
[42] Deudero S., Alomar C. (2015) "Mediterranean marine biodiversity under threat: Reviewing influence of marine litter on species" in Marine Pollution Bulletin, Volume 98, Issues 1–2: 58-68
[43] Near large cities and offshore canyons, the density could extend to 100,000 pieces per square kilometre. See further: Wurpel, G. loc.cit., p. 32, 35.
[44] https://ec.europa.eu/jrc/en/publication/harm-caused-marine-litter
[45] BIOIS, Plastic waste in the Environment, loc.cit, p. 114
[46] Most additives are fillers and reinforcements, plasticizers, colorants, stabilizers, processing aids, flame retardants, peroxides and antistats, each representing a whole family of chemicals.
[47] COM(2013) 123, GREEN PAPER on a European Strategy on Plastic Waste in the Environment
[48] Mato Y., Isobe T., Takada H., Kanehiro H., Ohtake C. and Kaminuma T. (2001) "Plastic resin pellets as a transport medium for toxic chemicals in the marine environment" in Environmental Science and Technology 35(2): 318-324
[49] Rios, L.M., Moore, C. and P.R. Jones (2007) "Persistent organic pollutants carried by synthetic polymers in the ocean environment" in Marine Pollution Bulletin 54: 1230-1237

enter the food chain via marine fauna which ingest the plastics (Trojan horse effect)[50]. These POPs do not break down naturally very easily but accumulate in body tissue, potentially having carcinogenic, mutagenic and other health effects[51].

Given the high leakage worldwide of plastics in the natural environment with harmful effects for a very long period of time, solutions have been sought to design plastics in a way that they can biodegrade in different environmental compartments. These solutions will however only make sense as a complement to a paramount effort to reduce plastic leakages. Complete biodegradation of plastics, a process involving microbial action, occurs when none of the original polymer remains[52]. Most currently available biodegradable plastics generally degrade under specific conditions, which may not always be easy to find in the natural environment, and can thus still cause harm to ecosystems. Biodegradation in the marine environment is particularly challenging even though recent research projects[53] have shown some progresses made regarding this issue.

Marine litter not only affects economic activities such as tourism and fisheries and entails substantial cleaning costs, fighting against it also creates economic opportunities. Innovation in product design to avoid plastic litter and microplastics, but also investments for marine litter prevention (e.g. in waste and waste-water treatment, in port reception facilities or recycling of fishing nets) can create jobs and strengthen technical and scientific skills and industry competitiveness in areas of growing global interest.

The impacts of plastic marine debris on the environment and human health can also be structured according to the size of the plastic litter[54]:

- **Impacts of macroplastics (i.e. pieces of plastics larger than 5mm)**
    - **Plastic ingestion** is increasing (identified in 27% of species in 1997 and 44% in 2014), and can cause mortality directly or can affect animals through slower sub-lethal physical and chemical effects reducing the growth rate or the reproductive ability of the affected animals. According to one estimate, "99 per cent of all seabirds will have ingested plastic by mid-century[55]". This may also affect fish population thus reducing marine fisheries productivity and profitability. There is an abundance of case studies displaying the magnitude of the issue. Between January and February 2016 more than 30 sperm whales beached along the North Sea coast. From the 22 carcasses investigated, 9 had netting, ropes, foil, packaging material and even a part of a car in their gastrointestinal tracts. In the Mediterranean Sea, a deceased sperm whale was found with 7.6 kg of ingested plastic debris, leading to a rupture of its stomach.
    - **Entanglement incidents** (for example with cords, plastic wrappings, netting) with marine life also appear to be increasing and affect many species; including 100 % of

[50] Rios, L.M., Jones, P.R., Moore, C. and U. Narayan (2010) "Quantification of persistent organic pollutants adsorbed on plastic debris from the Northern Pacific Gyres' "Eastern Garbage Patch"", accepted in Journal of Environment Monitoring
[51] BIOIS (2010) Plastic waste in the Environment, final report, European Commission, p. 117 http://ec.europa.eu/environment/waste/studies/pdf/plastics.pdf
[52] https://wedocs.unep.org/bitstream/handle/20.500.11822/7468/-Biodegradable_Plastics_and_Marine_Litter_Misconceptions,_concerns_and_impacts_on_marine_environments-2015BiodegradablePlasticsAndMarineLitter.pdf.pdf?sequence=3&isAllowed=y
[53] Bio-based biodegradable PHA/PHB EU FP7 Open-Bio project – Marine biodegradation work package
[54] Eunomia, 2016 …
[55] Petter Malvik, UN Environment Programme's Communications Officer http://www.un.org/apps/news/story.asp?NewsID=56638#.Wmm8Ymd5bcI

marine turtles (7 of 7 species), 67 % of seals (22 of 33 species), 31 % of whales (25 of 80 species) and 25 % of seabirds (103 of 406).[56] Entanglement causes serious harm: for example, entangled organisms may no longer be able to acquire food and avoid predators, or become so exhausted that they starve or drown. This may pose a serious risk for threatened populations of marine mammals, reptiles and birds with a special protection status.

- **"Ghost" fishing**: While around one-third of beach litter has the potential to entangle animals, lost or abandoned fishing gear poses a particular risk as it may continue to fish for years or even decades) to various degrees. This depends on such factors as the type of fishing gear, the place where it has been lost and prevailing oceanographic conditions, with the fishing capacity of ghost nets estimated at 6-20% of their initial fishing capacity over their remaining life time. According to Sancho et al. (2003), lost tangle nets in northern Spain catch about 5% of the total commercial catch of monkfish. An analysis of data collected by ghost-gear retrieval initiatives in the USA estimated that annually more than 3.5 million animals were entangled in 5000 removed nets, including 1300 marine mammals, 25 000 birds, 100 000 fish and over 3 million invertebrates.
- **Decreased biodiversity:** By colonising floating plastic and using it to travel longer distances than otherwise possible, the extension of the range of certain species or the introduction of new ones can occur. This may cause significant changes in population structure. One study predicted that global marine species diversity might decrease by as much as 58% if worldwide biotic mixing occurs.[57] The increase of human structures and litter in the ocean may be contributing to the increase in jellyfish blooms[58]
- **Sea floor pollution:** debris can smother the sea floor and reduce coral cover or decrease the oxygen content in the benthos that could alter the composition of life on the sea floor.[59] This is particularly the case when large quantities of plastic material are illegally thrown overboard rather than brought back to port. A recent study[60] found that the likelihood of disease increases from 4% to 89% when corals are in contact with plastic. This study also estimates that 11.1 billion plastic items are entangled on coral reefs across the Asia-Pacific and projects this number to increase 40% by 2025.

- **<u>Impacts of microplastics (i.e. pieces of plastics smaller than 5mm)</u>**
  - **Ingestion or absorption:** The small size of microplastics enables them to interact with a particularly wide range of marine organisms where they can affect the marine food chain via ingestion or absorption. Recent samples taken in the context of deep-sea research found that in the bottom of the Mariana Trench, every single invertebrate

[56] Kühn, S., Rebolledo, E.L.B., and Van Franeker, J.A. (2015) Deleterious Effects of Litter on Marine Life, in Melanie Bergmann, Lars Gutow, and Michael Klages, (eds.), Marine Anthropogenic Litter (2015) Springer International Publishing

[57] Mckinney, M.L. (1998) On predicting biotic homogenization: species-area patterns in marine biota, Global Ecology & Biogeography Letters, Vol.7, No.3, pp.297–301

[58] See p.89 of http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/Marine_plastic_debris_and_microplastic_technical_report_advance_copy.pdf

[59] Goldberg, E.D. (1997) Plasticizing the Seafloor: An Overview, Environmental Technology, Vol.18, No.2, pp.195–201

[60] Lamb, JB et al (2018) Plastic waste associated with disease on coral reefs, Science, January 2018,, pp 460-462

collected had ingested at least one piece of microplastics. A recent study[61] confirmed the evidence for a potential risk to environmental organisms from the toxic and physical effects to be exhibited on exposure to microplastics. The study concluded that a potential risk to the environment may arise from the presence of microplastic particles used in the production of various products for consumer and professional use that get into the aquatic environment, and that these risks need to be addressed on a EU-wide basis.

- **Impact nanoparticles:** The impacts of microplastics are also likely to hold true for particles of nanosize, especially regarding migration to animal or human body tissue, but more data is needed.

- **Impacts of toxic substances associated with plastic debris**
  - **Chemical toxicity:** Plastics contain a variety of potentially toxic chemicals incorporated during manufacture, which could be released to the environment.[62] Research has identified that many of these chemicals can have toxicological effects on fish, mammals and molluscs, hence a risk could exist if plastic fragments containing these chemical are ingested by marine organisms.[63] Microplastics ingested by marine animals can contain chemicals that can pass through to human body tissue if ingested, for example, plastic found in the fish's guts (processed to make fish food) or in the fatty tissues of wild caught or farmed fish. There is though no clear conclusion as to whether the chemicals pose additional harm over and above those already ingested through water and the like.
  - **Persistent organic pollutants:** Furthermore, plastic debris can absorb persistent organic pollutants (POPs) like PCBs, DDE, and nonylphenols (NP) that are present in the oceans from other sources.

Overall, a global assessment of the number of marine species affected by marine litter (CBD, 2016) found that 154 more species were affected since the previous review in 2012 (CBD, 2012). The total in 2016 of impacted species was 817, a 23 per cent increase. Restricting the assessment to ingestion and entanglement records for marine and coastal species revealed that a further 136 species are known to be affected, bringing the total number of affected species to 519. The main bulk of new species records were for the ingestion of plastics, including microplastics, and entanglement in lost or abandoned fishing gear (predominantly line, nets or pots). Many of the affected species are protected. For example of the 120 marine mammals species listed on the IUCN Red List of Threatened Species (IUCN, 2014), 54 (45 %) were reported to have interacted (ingestion and/or entanglement) with marine litter. About 15% of the marine mammal species affected through entanglement and ingestion are on the IUCN Red List. Cross-referencing only the 154 new records of affected species with the IUCN Red List indicated that approximately 10 per cent are threatened, vulnerable, endangered or critically endangered, including large baleen whales and geographically restricted sea bird

[61] Risk Assessment and socio economic analyses: 'Intentionally added microplastics in products' - http://ec.europa.eu/environment/chemicals/reach/pdf/39168%20Intentionally%20added%20microplastics%20-%20Final%20report%2020171020.pdf

[62] Lithner, D., Larsson, Å., and Dave, G. (2011) Environmental and health hazard ranking and assessment of plastic polymers based on chemical composition, Science of The Total Environment, Vol.409, No.18, pp.3309–3324

[63] Oehlmann, J., Schulte-Oehlmann, U., Kloas, W., et al. (2009) A critical analysis of the biological impacts of plasticizers on wildlife, Philosophical Transactions of the Royal Society B: Biological Sciences, Vol.364, No.1526, pp.2047–2062

species. In addition, a further nine species of affected cetacean were identified as either not assessed by the Red List to date or were data deficient, including five species of toothed whales. It is highly likely that there are substantially more marine species affected by marine litter, either directly or indirectly, given the ubiquitous presence of litter items, such as persistent microplastics in the marine environment (CBD, 2016).

2.14 Economic impacts from environmental externalities

The economic activities directly affected by marine plastic litter and microplastics include shipping, fishing, aquaculture, tourism and recreation. The cost associated could be estimated to be at least $8bn per year (UNEP, 2016). For the EU, costs to the tourism and recreation sector (extrapolated from beach cleaning costs) have been estimated up to €30 million per year; costs to the fishing industry up to €57 million. The "best estimate" within this range is a total of almost €470 million. Economic damage from litter on marine industry users was estimated to be $1.26bn per annum to marine industries in the Asia Pacific region. UN Environment estimates the damage to marine environments globally to be at least $8bn per annum.

Sources for economic impacts

Firstly, the costs to the fishing industry up to €57 million are taken from UNEP (2016), Marine plastic debris and microplastics – Global lessons and research to inspire action and guide policy change, United Nations Environment Program, Nairobi, and based on Mouat et al. 2010 in Arcadis 2014:

Table 12: Fishing and aquaculture gear material flow, 2015

Type of cost	Cost per vessel (€)	Estimated cost for the EU (M€)	Calculation method
Reduced catch revenues (contamination forces fishermen to use more time for the selection of their catches and to discard part of them)	2,340	28.64	The cost estimated by Mouat et al. (2010) for Scottish vessels (€2,200 per vessel per year), actualised in 2013 prices, was multiplied by the number of EU trawlers (EU vessels that use seafloor fishing gear), i.e. 12,238
Removing litter from fishing gear	959	11.74	The time needed to remove litter from fishing gear, as estimated by Mouat et al (2010) for Scottish vessels (41 hours per vessel per year), was multiplied by the average EU27 labour cost (€23.4 per hour) and then by the number of EU trawlers (EU vessels that use seafloor fishing gear), i.e. 12,238.
Broken gear, fouled propellers	191	16.79	The cost related to broken fear and fouled propellers, as estimated by Mouat et al. (2010) for Scottish vessels (€180 per vessel per year), actualised in 2013 prices was multiplied by the total number of fishing vessels in the EU (87,667 according to Eurostat).

Costs to the tourism and recreation sector are taken from Arcadis, 2014, "Marine Litter study to support the establishment of an initial quantitative headline reduction target". The total quantified cost of degradation is estimated to be 259 M€ to 694.7 M€. These however represent a small portion of actual costs as it has not been possible to quantify impacts to all economic sectors. The monetised costs are attributed to tourism and recreation (up to 630 M€) and fisheries (up to 62 M€) as the 'main affected sectors'. It has not been possible to monetise the costs of all the affected groups and sectors, such as shipping and voluntary beach cleaning, or cleaning of harbours and marinas.

In turn, this study used the JRC Report "Harm caused by Marine Litter" 2016, which reported on the basis of a comparatively small sample size, wide fluctuation in the clean-up costs between bathing and non-bathing beaches, as well as between countries. The JRC report then quoted an estimate of the costs of marine litter clean-up at the European level for the more than 50,000 kilometres of EU coastline of between approximately 194 and 630 M€, assuming that all beaches would be cleaned.

3 REDUCING MARINE LITTER

A detailed analysis of marine litter was included in SWD (2018) 16 accompanying the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on "A European Strategy for Plastics in a Circular Economy", COM(2018) 28. This SWD covered many of the issues above from a plastics perspective, and also measures to curb plastic waste and littering. The following chapter summarises this analysis.

3.1 Single-use plastics: issues, definition and insights from existing measures

3.1.1 Issues at stake

In a recent UNEP report, States are encouraged to "*develop and implement laws to ban or diminish the production of single-use trash items and other waste that is commonly found in marine litter*"[64].

Whether an item is a single-use item or reusable, once it is littered in the environment, it has the same negative environmental impact. Plastic degradation in open environment can take hundreds of years. During this period plastics fragment into smaller pieces. Plastic debris causes sea species to suffer from entanglement or ingestion. Microplastics causing harm to fauna and flora are generated and are potentially harmful for human health. This represents both a common and a transboundary challenge.

A single-use plastic item reaches its end-of-life in a very short time, which shows that resources are not efficiently used. Indeed, if this item were designed for reuse and effectively reused, this would save the resources and energy that were used in their production.

Moreover, such items once disposed of, becomes waste that needs to be collected and sorted thereby implying costs for public authorities. Although such items could be recycled, most of the time they are not. Causes are multiple and often interlinked: insufficient public waste management infrastructure, food and organic material contamination once put in the right bin, etc. Therefore, this leads to consider that not only resources are wasted in their production phase but the value of materials is not kept in the loop which is the contrary of a circular

[64] UNEP : "Marine Litter Legislation: A Toolkit for Policymakers"

economy concept and can also be seen as contrary to the waste hierarchy enshrined in the Waste Framework Directive which states that policy should also aim at reducing the use of resources, and favour the practical application of the waste hierarchy in accordance to which prevention should be considered in priority to other waste management options such as recycling for instance.

Several Member States are already taking action regarding single-use items by implementing the Marine Strategy Framework Directive[65]. France for example plans to restrict the use of several of these SUP by 2020, unless they are home-compostable and at least 50% bio-based (pushing thus for a substitution by paper, cardboard, wood and others)[66]. United Kingdom and Ireland area also considering actions. Regional and more local actions have been taken, such as:

- In Navarra the sale of single-use plastic cutlery, trays and cups is to be banned by 2020, the provision of tap water in public spaces and in restaurants will be made obligatory, and the sale of bottled water prohibited in all public buildings except hospitals.
- In Bristol, consumers can refill their reusable water bottles for free in many cafes, restaurants and others. An app locates the closest refill station. The project is expanded to five other cities.
- In Vienna and Munich, portable washing stations provide a specific service to wash reusable containers in food markets.
- Vienna introduced an obligation to use reusable items at big events.
- Hamburg bans disposable packaging in public buildings, which includes bottled water and beer, plastic plates and cutlery.

3.1.2 Definition of single-use plastics

Currently a legal definition nor official statistics exist for single-use plastic production.

Given that plastic packaging is almost exclusively single-use, especially in business-to-consumer applications, such items could be defined in the Packaging and Packaging Waste Directive (PPWD). In the latter, a distinction is made between packaging, i.e. all products made of any material of any nature to be used for the containment, protection, handling, delivery and presentation of goods, from raw materials to processed goods, from the producer to the user or the consumer, and "non-returnable items" used for the same purposes. One could consider therefore that "non-returnable items" are equivalent to single-use items.

Acknowledging that single-use items are currently not defined from a legal perspective, the Commission worked with stakeholders establishing criteria for what should be targeted as relevant single-use items:

- Prone to littering and prevalently ending in the marine environment;
- Short use phase;
- Consumed predominantly away from home;
- Reusable or non-plastic alternatives exist.

[65] Member States have to monitor marine litter and draft/implement programmes of measures notably to reduce marine litter in their marine waters.
[66] Loi de Transition Energétique pour la Croissance Verte (LTECV) du 18/08/ 2015

3.1.3 Insights from the Plastic Bags Directive

Plastic bags is a specific case of Single-Use Plastics. The EU has already taken steps by setting requirements for Member States to adopt measures to cut the consumption of plastic bags.

In 2010, an estimated 98.6 billion plastic carrier bags were placed on the EU market, which amounts to every EU citizen using 198 plastic carrier bags per year. Out of these almost 100 billion bags, the vast majority are lightweight bags, which are less frequently re-used than thicker ones. Consumption figures vary greatly between Member States, with annual use per capita of lightweight plastic carrier bags ranging between an estimated 4 bags in some Member States and 466 bags in other Member States.

Lightweight plastic carrier bags are considered to be packaging within the meaning of Directive 94/62/EC[67] on packaging and packaging waste (PPWD). Member States may take a wide range of actions, which shall include at least one of the following measures:

- a national maximum consumption level of plastic carrier bags of maximum 90 bags per person per year by 31 December 2019 and maximum 40 bags per person per year by 31 December 2025;
- instruments ensuring that, by 31 December 2018, lightweight plastic carrier bags are not provided free of charge to customers at a point of sale.

Very lightweight plastic carrier bags (i.e. with wall thickness below 15 microns) are mainly used for the packaging of loose fruits and vegetables may be excluded from the above 2 measures.

It is not yet possible to provide EU-wide statistical data on reduction of consumption of these bags. By mid-October 2017, six Member States had not notified implementing measures, but informed that measures would be adopted still in 2017. Nevertheless, some Member States currently apply measures ahead of the deadlines and these Member States find considerable reduction in the consumption of lightweight plastic carrier bags.

The implementing measures to reduce use of plastic bags have met little resistance from consumers, and are rather welcome and seen as an effective measure. They are also very efficient in reducing littering in coasts and seas. The tax on plastic shopping bags in Ireland, in 2002, resulted not only in a 90% reduction of plastic bags provided in retail outlets (Convey et al., 2007) but also in a marked decline in bags found on beaches, according to Coastwatch beach monitoring data[68].

3.2 Plastic waste from sea-based sources: sources and existing EU measures

Plastic products are common in the fishing, aquaculture, shipping (cruise ships, merchant vessels, fishing and recreational craft) and other offshore activities [69]. These industries have become reliant on plastic material to provide affordable, lightweight and durable equipment. Very few estimates of plastic waste generation in the fishing and aquaculture sector exist though.

[67] Directive 94/62/EC on packaging and packaging waste; OJ 1994 L.365 of 31.12.1994, p. 10
[68] From an average of 18 plastic bags/500m in 1999 to 5 in 2003. See p.32 of JRC report on sources of litter: http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/MSFD_identifying_sources_of_marine_litter.pdf
[69] Eunomia (2016), Van Franeker (2010), UNEP (2009), GESAMP (2007)

Whilst on average the overall quantities of plastic waste discarded at sea are small compared to waste not dealt with properly on land, the impact is significant because the pathway to the sea is direct, and in some sea regions, such as the North East Atlantic and the North Sea, is significant. Of these sources, the loss of fishing gear is easiest to identify and quantify because it is instantly recognisable. Video inspection of seafloors[70] and surveys of northern beaches[71] indicate that fishing gear makes up a high proportion of distinguishable objects. This plastic creates the same problems as that from land based-sources as it breaks down into smaller pieces but causes an additional and well-documented harm to marine life through entanglement in nets.

Several causes of discharging litter at sea were identified during stakeholder interviews[72] as well as collating information on reviews on the causes of abandoned, lost or otherwise discarded fishing gear:

- Accidental and sometimes irretrievable loss of material, limited life-span of some items and nature of fishing method;
- Mismanagement of waste, including plastic waste e.g. dumping on land or sea, due to high cost of waste handling, inadequate facilities and/or handling on board or lack of adequate reception facilities in ports for waste storage and consignment, lack of operators willing to handle gear or waste;
- Lack of incentives to handle waste from ships, including recycling, reuse, retrieval of lost gear or consign end-of-life gear;
- Lack of end markets for re-use and recycling outputs and lack of operators willing to handle gear.

3.2.1 Shipping and other offshore installations

The shipping sector includes all seagoing vessels, from large cruise ships to small fishing vessels and pleasure craft. There are no indications from recent studies and assessments that the amount of garbage from ships (marine litter) has decreased in recent years. On the contrary, time series of marine litter on European shores indicate that the problem has persisted since the implementation of the PRF Directive (Directive 2000/59/EC). Although garbage delivered in ports has increased since the introduction of the Directive, a significant delivery gap remains, estimated between 60,000 and 300,000 tonnes, i.e. 7% to 34% of the total garbage waste to be delivered annually[73].

A revision of the PRF Directive was recently adopted, and will reduce further this source of marine litter.

3.2.2 Abandoned, lost and otherwise discarded fishing gear (ALDFG)

Commercial fishing gear lost, abandoned or discarded annually at sea or in the world's oceans may continue to fish for years or even decades, a process referred to as "ghost fishing". In an EU context, the extent and consequences have been subject to a number of EU funded

[70] Pham et al. Marine Litter Distribution and Density in European Seas, from the Shelves to Deep Basins PLOS ONE, 1 April 2014, Volume 9, Issue 4

[71] Marine Pollution Bulletin Volume 107, Issue 1, 15 June 2016, Pages 52–58

[72] In the context of the impact assessment for the revision of the PRF Directive, which included a specific survey for the fishing sector and also built on the outcome of the 2016 Eunomia study on sea-based sources of marine litter.

[73] Eunomia study 2016; and DG MOVE Impact Assessment for the revision of the PRF Directive, to be published in January 2018 together with the proposal for a new Directive

studies[74,75 ,76]. In general terms, it appears likely that substantial lengths of netting are lost each year. Each nation's fleet may be losing several hundred kilometres. Most nets are lost as a result of events like storms or being towed away by trawlers. Indications are that a majority of nets lost in such circumstances are either disabled or have a low residual catch efficiency. The FAO report concludes *"that ghost fishing from 'active' fishing gears such as trawl nets and from 'static' pot fishing is not significant in European Union (EU) waters*". According to scientific research the remaining fishing capacity of ghost nets varies from 6-20% of their initial fishing capacity[77].

In relation to the total number of nets used in EU waters, the rates of permanent net loss appear to be below one per cent of nets deployed. Most nets are deployed in shallow waters, and a significant proportion of lost nets are recovered through the use of global positioning systems (GPS); fishers typically go to considerable lengths to recover nets given their cost. During the evaluation of the Control Regulation, only one Member State authority reported that it routinely collect notifications of lost gear[78].

A number of Member States undertake retrieval surveys based on reported losses and other evidence. Many Producer Organisations report the position of static gears on a daily basis to minimise conflict between static and mobile fishing gears. Such initiatives can reduce the levels of gear loss and can benefit from the support of the European Maritime and Fisheries Fund (EMFF). In response to the studies on ghost fishing, the EU Control Regulation[79] and the associated implementing regulation[80] introduced mandatory requirements to report lost nets, and improvements and specifications for the marking of fishing gear in order to mitigate such losses.

3.2.3 Aquaculture

Aquaculture contributes to marine litter also, though to a minor extent, with the main sources associated with sea-based farms, such as cages, longlines, poles and other floating and fixed structures used for the culture of marine animals and plants. There are no reliable estimates of the contribution of aquaculture to marine litter to date.

The types of material lost would depend on the type of culture systems, construction quality, vulnerability to damage, and management practices and could be nets and cage structures (for

[74] Project Nº 94/095: Incidental impact of gill-nets (FANTARED)
[75] A study to identify, quantify and ameliorate the impacts of static gear lost at sea (FANTARED 2). EU Study Contract FAIR CT98-4338
[76] FISH/2006/15/Lot No.5", SI2.466030 "Recuperation of fishing nets lost or abandoned at sea" (DEEPCLEAN)
[77] Werner, S., Budziak, A., van Franeker, J., Galgani, F., Hanke, G., Maes, T., Matiddi, M., Nilsson, P., Oosterbaan, L., Priestland, E., Thompson, R., Veiga, J. and Vlachogianni, T.; 2016; Harm caused by Marine Litter. MSFD GES TG Marine Litter - Thematic Report; JRC Technical report; EUR 28317 EN; doi:10.2788/690366.
http://publications.jrc.ec.europa.eu/repository/bitstream/JRC104308/lbna28317enn.pdf.
[78]

Year	2010	2011	2012	2013	2014
number of reports of lost gear (Portugal)	65	79	93	180	89
number of reports of lost gear (other Member States)	8	8	14	6	2

[79] Council Regulation (EC) No 1224/2009 of 20 November 2009 establishing a Community control system for ensuring compliance with the rules of the common fisheries policy
[80] Commission Implementing Regulation (EU) No 404/2011 of 8 April 2011 laying down detailed rules for the implementation of Council Regulation (EC) No 1224/2009 establishing a Community control system for ensuring compliance with the rules of the Common Fisheries Policy

marine fish cages), lines or floating raft structures (for seaweed systems) or poles, bags, lines, and plastic sheeting (for mollusc farming). Because many of these items are expensive, one might expect farmers to take considerable care to avoid losses.

A Canadian study[81] showed that greater concentrations of micro plastics were measured in farmed mussels than in wild mussels, which may be a result of farming practices that use polypropylene lines to anchor the mussels, or it may be due to differences in micro plastic concentrations in the different locations from which the farmed mussels and wild mussels originated.

Another study[82] found that mussel nets are among the most common items found in areas of the Adriatic and Ionian seas with intensive and extensive aquaculture activities. Shellfish farming techniques and any potential litter generated differ according to local conditions in the sea basin.

However, given that global aquaculture production accounts for more than 50% and marine aquaculture of fish and molluscs for nearly 15% of global seafood production, the contribution of the sector to marine litter may be rising in importance[83].

3.2.4 End-of-life recreational boats

End-of-life recreational boats could become a significant source for marine litter. Yachts' average lifespan has been estimated at 30 years, although in some instances this may stretch to 40-45 years. This lifespan has further increased over time due to the use of stronger materials, such as fibre reinforced polymer (FRP). It is thought that between 1% and 2% of the 6 million boats kept in Europe, in other words at least 80,000 boats, reach their 'end of use' each year. However, only around 2,000 of those are dismantled. A significant number of the remaining boats are left abandoned, potentially ending up in the ocean and becoming marine litter[84].

3.2.5 Tourism

While tourism is a major source of littering on beaches, the proportion of this litter finding its way into the sea is unknown.

3.2.6 Existing EU measures for sea-based sources of marine litter

The Commission has been tackling sea-based sources of marine litter with a variety of policy instruments.

---

[81] Mathalon A., P. Hill Microplastic fibers in the intertidal ecosystem surrounding Halifax Harbour, Nova Scotia Mar. Pollut. Bull., 81 (2014), pp. 69-79

[82] On beaches located along the coastline of the Adriatic and Ionian Seas mussel nets were the seventh most frequent items found (Vlachogianni et al., 2016). Furthermore, in surveys carried out along the Italian coastline, mussel and oyster nets were among the top three items recorded on beaches, while the results obtained from the seafloor surveys show that litter from aquaculture accounts for 15% of total items recorder (Pasquini et al., 2016). Indicatively some preliminary results from Fishing for Litter activities in the area show that mussel and oyster nets account for almost 30% of the total weight of the items collected. (JRS report: Sources of marine litter).

[83] Elaboration from FAO State of World Fisheries and Aquaculture 2016; Total global aquaculture production (including freshwater fish, aquatic plants, and marine fish and molluscs) accounts for more than 50% of world seafood production. Marine fish and mollusc aquaculture accounts for 26% of global aquaculture production or nearly 15% of total global seafood production.

[84] Commission Staff Working Document on Nautical Tourism, SWD(2017) 126 final

Directive 2000/59/EC on port reception facilities for ship generated waste and cargo residues aims at reducing discharges of waste from ships at sea. It requires the provision of adequate waste reception facilities in ports, and ensures the use of those facilities through a mandatory delivery requirement for ships before departure from any EU port. The Directive also requires the establishment of cost recovery systems which are based on the application on an indirect fee, to be paid irrespective of delivery, in order to provide no incentive for ships to discharge their waste into the sea. Since the adoption of the PRF Directive, volumes of ship-generated waste and cargo residues delivered to EU ports have increased significantly[85]. However, waste continues to be discharged at sea. Other waste streams, such as oily waste and sewage, also continue to be discharged at sea in contravention with existing discharge norms/prohibitions[86]. Important underlying drivers of these problems were found to be: the unavailability of adequate reception facilities in ports, the lack of enforcement of the mandatory delivery obligation for ships, and the lack of economic incentives for delivery[87].

Of particular relevance to the fishing and aquaculture sectors are instruments preventing or prohibiting the voluntary discarding of plastic waste, in particular derelict gear, on the one hand, and instruments mitigating or promoting the recovery of lost gear which may generate ghost fishing. While the former can be addressed through environmental protection measures, the latter has led the Commission to undertaking studies on estimating the magnitude and impact of ghost fishing[88] and on the recovery of ALDFG[89].

The Control Regulation[90] requires the mandatory marking of gear as well as the notification and retrieval of lost gear. A more detailed assessment of the implementation of the requirements of the Control Regulation will provide important information on its impacts and potential improvements.

The European Maritime and Fisheries Fund (EMFF) allows for finances a variety of activities combating litter from sea-based activities and especially so-called passive fishing for litter, whereby fishers bring litter fished up in nets while fishing back ashore. Other potential activities are retrieving lost gear, the provision of litter bags for collection at sea, investments in facilities for waste and marine litter collection and processing, recovery and recycling of nets.

Over the seven year period 2014-2020, 14 Member States envisage a total of 108 fishing for litter operations that are supported with around €22M from EU funds, equalling 2% of the EMFF. While the allocation is still rather modest, the increase in comparison to the previous funding period is significant with the planned EU financial contribution having more than tripled and the number of Member States funding marine litter activities with the EMFF as well as the number of projects having at least doubled. . A recent call for proposals will be complementing these activities with a number of transnational projects on the reduction, monitoring, removal and recycling of marine litter being supported 2019-2020 focussing on long term sustainability and buy in from stakeholders.

[85] Ex-post evaluation of the PRF Directive, Panteia, 2015
[86] Ecorys (2017). Op. cit.
[87] The REFIT Evaluation that was undertaken for the PRF Directive 2000/59/EC in 2015
[88] Ghost fishing by lost fishing gear (August 2005) DG FISH/2004/20 institute for European environmental policy, Poseidon aquatic resource management
[89] Recuperation of fishing nets lost or abandoned at sea (September 2009) Graham, N. 1*, Hareide, N-R.2, Large, P.A.3, MacMullen, P.4, Mulligan, M .5, Randall, P.J.3, Rihan, D.5, and Peach, D
[90] Council Regulation (EC) No 1224/2009 of 20 November 2009 establishing a Community control system for ensuring compliance with the rules of the common fisheries policy

3.3 Microplastics

Microplastics are plastic particles of a size below 5 mm. Some of these microplastics are produced to be intentionally added to products (e.g. scrubbing agents in cosmetics, detergents, paints) or to serve as input for further processing (e.g. plastic resin pellets). Others originate from the abrasion of large plastic objects during manufacturing or use (e.g. tyre dust, textile fibres), or after these objects have leaked into the environment.

The potential impacts of microplastics on the environment, associated with their intentional or incidental use in products, have generated a lot of concerns worldwide. The Council has invited the Commission to take measures on microplastics, in particular from cosmetics and detergents under the Strategy on Plastics.

During the preparation of the EU Strategy on Plastics an Open Public Consultation on microplastics was organised with almost 500 responses (roughly 50% from individuals vs companies). Citizens are most concerned about harm to marine life, there's high awareness of cosmetics and textiles microplastics, and with the highest concern for textiles, legislative measures are generally favoured at the European level with the cost burden put on the manufacturers and bans are favoured for all of the intentionally added ingredients.

A recent study[91] estimated that the total number of floating macro- and microplastics in the open oceans is 5,25 trillion pieces, weighing 269,000 tonnes. Microplastics were calculated in the order of 200 thousand tonnes in the EU[92].

Table 13: Annual microplastics emissions to surface waters from the EU (+Norway and Switzerland)[93]

Source	Upper (tonnes)	Midpoint	Lower (tonnes)	Source Data Year
Automotive Tyres	136,000	94,000	52,000	2012
Pellets	91,000	47,000	3,000	2015
Washing of Clothing	23,000	13,000	4,000	2016
Road Markings	21,000	15,000	10,000	2015
Building Paint	8,000	5,000	2,000	2013
Fishing Gear	9,000	5,000	1,000	2015
Automotive Brakes	5,000	2,000	100	2012
Artificial Turf	3,000	2,000	300	2012
Marine Paint	400	400	400	2013
Leave on PCP	526	-	86	-
Fertilisers	400	-	85	-
Rinse off PCP	373	-	114	-
Building Paint	141	-	0.40	-
Detergents	94	-	30	-
Total	300,000		72,500	

[91] Eriksen et al.2014

[92] EU microplastics. Ongoing study for the Commission: http://www.eumicro-plastics.com/eumpwp/wp-content/uploads/investigating-options-eunomia-draft-report-v4-main-report-public.pdf

[93] Note: Data for the calculation of emissions comes from different years for each emission source. The results are normalised to 2017 for the baseline calculations using the midpoint. All Figures except for those from 'intentionally added' products (highlighted in red) are rounded, therefore totals may not add up.

Note: Data for the calculation of emissions comes from different years for each emission source. The results are normalised to 2017 for the baseline calculations using the midpoint.
Figures are rounded therefore totals may not add up

Some companies have already taken measures to phase out progressively the use of certain microbeads in some of their products.

3.4 Existing measures: EPR and Deposit Return Systems

3.4.1 EPR fee modulation and more transparency

Extended Producer Responsibility (EPR) is defined as "an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle"[94]. There are a variety of EPR policy measures and instruments that aim to shift the negative environmental externalities of products from taxpayers to producers and to incentivise producers to take environmental considerations into account at the product design phase.

Such measures can also take the form of EPR schemes whereby producers are made responsible for the financing and organisation of the waste management of their end-of-life products. The objectives of such EPR schemes are to

- relieve public authorities (partially) of the cost of managing a specific waste stream, transferring the financial burden from taxpayers to consumers;
- internalise the cost of end-of-life management of a product in the price of new products, thus providing an incentive for ecodesign approach; and
- ensure effective and environmentally sound collection and treatment of that waste stream.

By internalising costs and establishing a well-designed fee system, EPR can encourage a change in behaviour of relevant actors involved in the product value chain from plastic manufacturers to consumers and recyclers. Design for reuse and for recycling and more sustainable products are awarded.

It is to be noted that the existing EPR schemes, including for packaging, already provide for some fee modulation based on simple criteria such as type, material or weight of packaging.

3.4.2 Deposit return schemes (DRS)

DRS are based on additional fees on some products, which have to be paid by the consumer at the sales point of a given item in the form of a deposit. The deposit fee is returned to the consumer when bringing back the item. Most deposit schemes have been set up for packaging waste, especially for drinking bottles, but also for transport packaging (boxes and pallets). They are usually established at national level, although there are some deposit systems with a regional or local scope. In the case of packaging, the fee is usually determined by the packaging material and the container size and is indicated via a label on the packaging.

Deposit schemes provide an economic incentive to waste holders to bring their waste back to return points. This ensures usually high return rates (above 95% or more in Germany and the Netherlands) and are thus an effective means to combat littering. In addition, the items that

[94] Source: RELOOP http://www.cmconsultinginc.com/wp-content/uploads/2017/10/Fact-Sheet-Economic-Impacts-to-Municis-New.pdf

are returned are clean sorted fractions with very little contamination, and are therefore perfectly suitable for their reuse or recycling. The best documented case is the introduction of DRS for beverage containers, where the littering reduction potential usually exceeds 80% and the recycling levels for the beverage containers covered by the scheme attain 90-98%[95].

Table 14: Total return rate of deposit schemes in the EU[96]

Country	Data year	Total return rate
Croatia	2015	up to 90%
Denmark	2014	89%
Estonia	2014	78,6%
Finland	2014	92,6%
Germany	2014	97%
Lithuania	2016	74%
Netherlands	2014	95%
Sweden	2014	88,25%

DRS can be applied to a number of waste streams. They usually are effective in achieving a massive reduction of littering and in increasing recycling to very high levels. In addition, DRS provide an excellent basis for reuse of these materials (as is the case e.g. for refillable bottles in Germany), which generally constitutes a better option from an environmental point of view than recycling, as in line with the waste hierarchy.

DRS schemes can be part of EPR schemes or complement them. DRS can increase the quantity and quality of plastic waste collected and reduce litter. Therefore, the Commission recommends Member States to introduce DRS for waste types that have either a high polluting potential (e.g. fishing gear and agricultural plastics) or are managed in a sub-optimal way (low separate collection rates), which does not allow exploiting the recycling potential of that waste (e.g. plastic packaging in some Member States).

The level and the structure of the costs will depend on a number of social and geographical factors. DRS are mostly financed by unclaimed deposits (i.e. bottles that consumers do not return) and result in net savings for municipalities. Several studies[97] reported significant net cost savings from the municipalities that implemented DRS resulting from the reduced or avoided costs of collection, treatment, and disposal by the municipal waste management systems. However, DRS may result in additional costs to producers[98] as the level of the fees usually exceeds the level of the fees in the previously existing EPR scheme.

[95] Technical, environmental and economic viability study of the implementation of a deposit refund scheme (DRS) for single-use beverage in Catalonia, 2017

[96] Source: RELOOP http://www.cmconsultinginc.com/wp-content/uploads/2017/09/Fact-Sheet-Performance-New2.pdf ; Waste Framework Directive, Article 8.1

[97] Technical, environmental and economic viability study of the implementation of a deposit refund scheme (DRS) for single-use beverage in Catalonia, 2017

[98] In the case of the planned DRS for Catalonia, the net savings for municipalities are projected to amount to €14.9 million (approx. €2 per inhabitant). This is expected to result in additional costs to producers worth €8.3 million (or €1.1 per inhabitant). Additional costs appear to be very low and justifiable in view of the achievable environmental and resource efficiency benefits. Source: RELOOP http://www.cmconsultinginc.com/wp-content/uploads/2017/09/Fact-Sheet-Performance-New2.pdf

3.4.3 The Commission proposal to introduce minimum requirements and providing a possibility for fee modulation for EPR schemes

Mandatory EPR schemes are established in EU legislation for end-of life vehicles (Directive 2000/53/EC), for waste electrical and electronic equipment (Directive 2012/19/EU) and batteries and waste batteries (Directive 2006/66/EC). Most Member States have established EPR schemes for packaging in support of the implementation of the packaging and packaging waste Directive (Directive 94/62/EC), even if this is not required by the Directive. In the EU, Member States have set up more than 200 schemes covering these and other products, such as expired medicines, lubricants, pharmaceuticals, tyres, chemicals, agricultural foil etc.

The Waste Framework Directive (Art. 8) lays down some general principles for the implementation of EPR. This directive is currently under review with the objective to introduce minimum requirements for EPR schemes to improve their governance, transparency, cost-efficiency and a level playing among the different schemes across the EU.

One of the minimum requirements proposed by the Commission is to introduce an obligation on the Member States to ensure that the fees paid by the producers fulfilling their EPR obligation are modulated based on the product's environmental impact. Such 'modulated fees' hence take into account the actual end-of-life costs of individual products or groups of products, in particular, by taking into account their recyclability and re-usability. These minimum requirements on fee modulation would also apply to WEEE, ELV and batteries where EPR is obligatory under EU legislation, and some MS have already applied it even if not required specifically (e.g. France on electronics, packaging and printed paper). Also, existing EPR schemes, including for packaging, already provide for some fee modulation based on simple criteria such as type, material or weight of packaging.

Targeted and meaningful fee differentiation allows rewarding or penalizing the producers regarding design-related factors that have an impact on the end-of-life performance (reusability, dismantlability, recyclability…). For products containing plastic or made of plastic, fees have therefore a potential to be an effective instrument in promoting better product design, labelling, improved collection and treatment of waste in line with the waste hierarchy and more resource efficient use of plastic. Differentiated product fees with a notable economic impact have been identified as being capable of bringing a real change in practices and product design although it is too early to establish a generalised appreciation of such an impact. There are some limitations to the scope of this principle. Fee modulation may not be feasible or possible for all materials or design practices for numerous reasons such as the availability of waste management infrastructure and the technical feasibility of an alternative design fit for purpose or substitution of certain materials.

It is to be noted that the existing EPR schemes, including for packaging, already provide for some fee modulation based on simple criteria such as type, material or weight of packaging.

By internalising costs and establishing a well-designed fee system, EPR can encourage a change in behaviour of relevant actors involved in the product value chain from plastic manufacturers to consumers and recyclers. Design for reuse and for recycling and more sustainable products are awarded.

A variety of practices on fee modulation are already available in the EU and the Commission can assist Member States by facilitating the exchange of best practices and by developing guidelines. For instance, feedback from 'eco-modulation of fees' as applied in France in the

implementation of EPR under the WEEE Directive[99] has also pointed to factors of success. Amongst these factors the setting of eco-modulated criteria in a process that involves public authorities, producers as well as non-governmental consumer and environment organisations. The necessity for the approach and criteria to apply it at the EU level to become fully effective was also identified as a key element. Moreover, in the case of electronics, modulated fees also have the potential to support design changes for products for a global market.

In addition, In its proposed waste review, the Commission has emphasised the use of economic instruments to prioritise waste prevention and recycling at national level. For instance, high or gradually rising fees or taxes on landfilling and incineration could improve the economics of plastic recycling by clearly internalising the environmental costs of alternatives.

3.5 Examples of good practice

3.5.1 Examples of good practice related to SUP

General Commitments From Public Authorities Against Single-Use Plastics

United Kingdom: Commitment to eliminate avoidable plastic waste within 25 years. The UK is considering the implementation of a tax on single-use plastics.

Medway Council, on a local level, is planning to phase out plastic bottles, cutlery, cup, drinking straw in all Council buildings at Council events by June 2018.

Scotland: adopted a national litter strategy and a marine litter strategy in 2014 (communications toolkit, marketing campaign and adapted legislation to increase the fixed penalties for litter- £80 for anyone who drops litter.) Scottish Landfill Tax was introduced in April 2015. 70% set recycling rates target by 2025. Grants will be given to private companies to set up plastics recycling centres. Plans to ban single-use plastics by 2030;

The Netherlands: Dutch marine litter policy:

- Cooperation with stakeholders

- reduce solid waste by regulating products and improving waste management

- undertake cleanup projects;

- increase communication and awareness

- Targets for 2020 to reduce visible litter on the beach, and decrease the amount of litter found in marine organisms.

Spain Officials in Majorca, Menorca and Ibiza plan to end the sale of all single-use consumer plastics by 2020. Coffee capsules, disposable tableware, plastic cups and ear sticks, non-rechargeable lighters, disposable razors and non-reusable printer toners.

Wet wipes will not be banned as it would be problematic in terms of competition/markets legislation.

Costa Rica: Announced in 2017 a ban on single-use plastics by 2021

[99] The French Eco-modulation on electric equipment was updated in July 2015; now comprising 17 product types: fridge, freezer, washing machine, dishwasher, vacuum cleaner, coffee machine, kettle, tea machine, computer, notebooks, tablet, printer, phone, drilling machine, screwer, games console, lamps).

Haiti: bans the production, import, commercialization, and use in any form of plastic bags and objects made of styrofoam for food purposes, such as trays, bottles, bags, cups, and plates.

City Of Vancouver: developing since 2016 a Single-Use Item Reduction Strategy to explore how they can reduce waste from:

- Disposable hot and cold drink cups

- Plastic and paper shopping bags

- Polystyrene foam and other take-out containers

Currently launching a second consultation with all stakeholders groups.

Cigarette butts

RAISING AWARENESS

Clean Up Australia (NGO): Education on cigarette butts littering and clean-up campaigns

British American Tobacco Australia (Tobacco industry): has established an independent Butt Littering Trust (BATA 2002) with funds of up to $1 million in the first two years for actions to reduce the impact of cigarette butt litter. → Publishes reports, distributes information materials to Australian Council on butt littering issues, and undertakes awareness projects about butt littering (but biased position on danger to smoke).

MITIGATION FEE

San Francisco: implemented a cigarette litter abatement fee in 2011 by increasing the per pack price of all cigarettes by $0.20. By increasing the price of cigarettes, it discourages smoking and corresponding litter, and the proceeds from the abatement fee are used to finance street cleaning and environmental remediation directly related to cigarette waste.

DEPOSIT RETURN SYSTEM

New York: in 2015, developed a cigarette butts recycling program: A. Establishing a State wide System and redemption facilities for the collection of used cigarette butts via automated or non-automated recycling equipment. B. Establishing a deposit and refund value for individual cigarette butts returned to collection facilities of not less than 1 cent per cigarette returned. Fiscal plan created to allocate funds to education campaigns about the harm cigarette butts cause to the environment and labelling projects for cigarette packs.

EPR SCHEME

Australia: a public consultation has been conducted regarding cigarette butts and a variety of public and private stakeholder have pledged for the efficiency of an EPR scheme for cigarette butts.

SMOKE FREE AREAS

Canada: banned smoking on its freshwater beaches in 2013.

R&D

Terracycle: any customer can buy a special cardboard box and then ship it back to TerraCycle for recycling. The collected waste will be shredded and separated. The plastic

(such as the cigarette filters) will undergo pelletization and extrusion to be molded into various recycled plastic products. The paper will be recycled and the tobacco and other organics will be composted.

Receptacles are also proposed for distributing standardizing cigarette recycling in small or large-scale outdoor environments like in Davos since 2017 or in Vancouver, for instance.

Greenbutts: Start-up launching in 2018 "greenbutts", that are a biodegradable cigarette filter made from natural materials using no chemicals or artificial binders.

Green Bins: eco-friendly bins for cigarette butts with an integrated process for biodegradation and detoxification.

Plastic bottles, caps and lids

PUBLIC POLICIES

UK Green Public Procurement: Plan to ban plastic bottles + plastic straws from Royal Estates.

Copenhagen: The city has put up more than 60 drinking fountains all over Copenhagen, where citizens and guests can enjoy tap water for free. Map created, showing the drinking fountains available all year and the ones only available in summer.

London: Twenty new drinking fountains will be installed across London within a Plastic Free City initiative pilot scheme starting this summer. Collaboration with civil society: #OneLess campaign, led by the Zoological Society of London, who is supplying the fountains and will analyze whether the initiatives reduce the levels of plastic ending up in the environment.

Balearic Islands: Government officials are considering forcing bars and restaurants to offer free tap water to customers in a bid to reduce the amount of plastic bottles discarded on the islands.

California: California Assembly Bill 319 - From January 1, 2020, a retailer shall not sell or offer for sale, in the state, a single-use beverage container with a cap, unless the container meets one of the following conditions: (a) The cap is tethered to the container in a manner that prevents the separation of the cap from the container when the cap is removed from the container. (b) The cap includes an opening from which the beverage can be consumed while the cap is screwed onto or otherwise contiguously affixed to the container.

Melbourne: 60 water fountains now installed across the city through a joint initiative between VicHealth and the City of Melbourne. The City of Melbourne website features a map of the drinking fountains.

Barbados (Antilles): Barbados's beverage law provides that: "no distributor or dealer shall sell or offer for sale, at wholesale or retail in Barbados, any beverage that is contained in a beverage container without government permission." Distributors and dealers who have "an adequate system for the recycling of beverage container" may be exempted. The law imposes a fine of up to $500 and three months imprisonment for violations.

DEPOSIT RETURN SCHEME

Table 15. Countries in the EU with Deposit Return Schemes (source RELOOPo

Country	Population (million)	Mandate Enacted	Mandate Implemented
1. Croatia	4.3	2005	2006
2. Denmark	5.6	2000	2002
3. Estonia	1.3	2004	2005
4. Finland	5.4	N/A	1996, 2008 (PET), 2012 (Glass)
5. Germany	81.9	1991	2003
6. Iceland	0.3	1989	1989
7. Lithuania	3.0	2014	2016
8. Netherlands	16.8	2003	2005
9. Norway	5.0	1999	1999
10. Sweden	9.5	1982, 1991 (PET)	1984, 1994 (PET)

Scotland: The Scottish Government is already planning to introduce a deposit return scheme which would see customers pay a surcharge on plastic bottles which will be refunded when they return them to a shop. Zero Waste Scotland is commissioned to design the system. A public consultation is to be expected in spring 2018.

ECONOMIC INCENTIVES

Ganamos Reciclando (Recycling we all win): Spanish company providing, on a franchisee-agreement basis, reverse vending machines (RVMs) to be placed at food retailers, schools, sport centres and all kind of businesses. The customer returns the empty beverage packaging, the machine identifies the type of container by its barcode and provides on return either coins or a discount ticket for a small amount of money to be used in the shop or businesses adhering to the scheme during a certain period. It works similarly to a deposit-refund system, but it is fully private, independent from policy processes. There is no deposit; price of the product does not increase.

R&D

Ecover: Launch of the Ocean Plastic bottle. Made out of bioplastics (Plantplastic that is plant-based polyethelene), recycled and recyclable plastic. Can be produced by any company and be a mean to communicate awareness messages.

Ooho: spherical flexible package that can contain water and liquids like soft drinks, spirits and cosmetics. Biodegradable and edible, it is created from calcium chloride and sodium alginate, a seaweed derivative.

Onya (Australia): company that creates reusable products such as reusable shopping bags, produce bags, backpacks & coffee cups, stainless steel drink bottle.

VOLUNTARY AGREEMENT/COMMITMENT

Coca-Cola: Commitment to collecting and recycling the equivalent of 100% of its bottles, cans, and other packaging by 2030 + it aims to make bottles with an average of 50% recycled material. Planned investment in promoting understanding of recycling, working with local communities to improve recycling infrastructures as well as other nonprofit and corporate partners.

Danone: announced that it will produce all its plastic bottles from 100 percent recycled plastic by 2025.

English Businesses: Shops, cafes and businesses will offer free water refill points in every major city and town in England by 2021. The new scheme has been set up on the back of a previous initiative, the Refill campaign, which currently has more than 1,600 refill stations across the UK and operates in 13 towns and cities in England.

- Bristol: In 2015, the city adopted the campaign and the city now has more than 200 points.

- London: this bottle-refill initiative, in which businesses make tap water available to the public, will be set up across five areas of the capital over February and March 2018. If successful, it will be rolled out to the rest of the city in the summer. Plastic cups, bottles and cutlery will also no longer be available at City Hall under the plans.

- Businesses offering free tap water to the public will display signs in their windows. **Whitbread** (owning Costa Coffee and Premier Inn) is the first to sign up to the initiative and will provide water in all of its branches from March 2018.

Cotton bud sticks

PUBLIC POLICIES

France: Ban on cotton bud sticks with plastic stems from 1st January 2020 as part of the 'LOI n° 2016-1087 du 8 août 2016 pour la reconquête de la biodiversité, de la nature et des paysages'

Scotland: Announced in January 2018 a plan to ban plastic cotton buds. The Scottish Government plans on carrying out a public consultation about it.

Italy Plans to ban non-biodegradable plastic cotton bud sticks from 01/01/2019.

RAISING AWARENESS & ALTERNATIVES

Bag It And Bin It – Don't Flush It: In 2007 and 2008, the MCS and Surfers Against Sewage encouraged manufacturers and retailers to improve labelling of cotton buds and to replace the plastic cotton bud stick with a paper one. The campaign received support from leading retailers (Tesco, Sainsbury's, Safeway, Morrison's, Somerfield, ASDA, Co-op, Superdrug, and Boots) and key manufacturers (e.g. Johnson & Johnson and Smith & Nephew), who included the campaign logo and/or the correct disposal messages on products that consumers might flush. Results from the 2007 MCS Beachwatch event marked a decrease in the number of cotton bud sticks observed on UK beaches, from 172 items/km in 2006 to 97.5 items/km in 2007.

The Cotton Buds Project or "Switch the Stick": have called upon industry and retailers to replace plastic cotton bud stems with biodegradable alternatives. The two projects have slightly different approaches. The first engages with producers and retailers directly, asking companies to phase out the use of plastic, and provides consumers with information on which companies are offering alternatives to plastic. The second asks consumers to sign a petition asking UK retailers to stop making plastic cotton buds by the end of 2017.

VOLUNTARY AGREEMENT/COMMITMENT

Johnson & Johnson (Pharmaceutical Company): no longer sells cotton buds made with plastic handles since 2017, in favor of paper handles ones to prevent toxic waste reaching waterways and seas.

Sainsbury, Tesco, Co-Operative, John Lewis, The Body Shop, etc.: phased out plastic handles cotton buds from their own-brand products.

Northlink (Ferry Operator): removed plastic cotton buds from its board shops

Crisps packets/sweets wrappers

VOLUNTARY AGREEMENT/COMMITMENT

Marks & Spencer: in 2017, launched the 'Project Thin Air' → more than 140 of its best-selling products have been redesigned and repackaged in smaller, less bulky packets containing the same amount of food as before. The biggest reductions have been achieved in the retailer's popular popcorn range, with a 37% slimming down in pack size. Across its hand-cooked crisp rang, M&S is now using 20% less plastic. The changes have led to 75 tonnes of packaging being saved each year.

R&D

Terracycle: has created a zero waste solution for snack wrappers. It proposes to customers to buy a special cardboard box and then to ship it back to TerraCycle for recycling. It recycles: Individual, multipack and family-size snack bags and wrappers, including chip, candy and granola wrappers.

Polyflow: company that boasts an innovative technology that allows the mixing of "dirty plastic" and rubber waste: ability to turn candy wrappers and potato chip bags, into products like gasoline and diesel fuel, adhesives, household and industrial cleaners and paint.

Wet wipes

LABELLING

Balearic Islands require clear labelling of wet wipes by 2020;

Sanitary applications

RAISING AWARENESS

Ireland: In a study of over 1000 people in Ireland, 3 in 10 admitted to flushing such items down the toilet. Of these, 58% admitted to flushing baby wipes down the toilet, 40% facial wipes, and 24% tampons. More than half of those who flush these items down the toilet did so simply due to a lack of knowledge of the impacts.

Bag It And Bin It – Don't Flush It: The aim of the campaign was to reduce the incidence of sanitary items and other sewage-related debris (SRD) on UK beaches and riverbanks through a programme of education and partnership, encouraging people to dispose of personal waste carefully, and a better labelling of these products by manufacturers and retailers. In 2002, a school campaign was launched across 6,000 UK schools within which a variety of campaign materials were produced, (leaflets, posters, and stickers).

'Let's Stop The Block': awareness campaign against the flushing of wipes, nappies, cotton buds and sanitary products.

Bags

PUBLIC POLICIES

16 EU Members States have already imposed a tax on light-weight single-use plastic bags and two EU MS chose to implement a ban on these same items, following the **2015/720 EU directive** requirement to significantly reduce the consumption of lightweight (thickness below 50 microns) plastic bags in the EU.

These measures, apply most of the time, to thicker plastic bags (e.g. reusable) sold in supermarkets. According to the result of the Impact Assessment on thicker plastic bags on the marine environment, the scope of the EU legislation could be extended to a larger category of plastic bags.

France Ban of oxo-fragmentable bags (regardless of the 2015/720 Directive on lightweight plastic bags);

INTERNATIONAL COALITION

'Stop Plastic Waste Coalition': International coalition against plastic waste and most specifically against single-use plastic bags, initiated in 2016 by France, Monaco and Morocco.

Members: France, Morocco, Monaco, Chile, Australia, Bangladesh, Italy, Senegal + representatives from the civil society

Commitment from members: to promote, in particular, elimination of these plastic bags in a consistent manner with existing international instruments and policies, and to share experience, expertise and best practice gained by States that already take action on this matter. + Financial contribution from France to the Global Partnership on Marine Litter for 2017-2020.

BAN ON ALL PLASTIC BAGS (regardless of thickness)

Bangladesh: First country to ban all "'polythene shopping bag[s]' which means a bag … or other container which is made of polyethylene or polypropylene or any compound or mixture thereof and is used for purchasing, selling, keeping or carrying another article." Bags manufactured for export are exempt from the ban. The law imposes a fine and up to ten years imprisonment for those who "manufacture, market or import" plastic bags, compared to up to six months imprisonment for those who "sell, exhibit for sale, stock, commercially transport or commercially use" them.

Rwanda: Legislators not only banned the manufacture and sale of all polythene bags within its borders in 2008, but also banned the import of all such bags. Violators face stiff penalties and fines. The law requires anyone wishing to "manufacture, import, use and sell" polythene bags to send a written request to the Rwanda Environment Management Authority, along with the "reasons for the request and the ways through which he or she will manage the polythene waste."

Tamil Nadu (India): subnational ban on all plastic bags. This ban also covers "cup, tumbler, plate, spoon, fork, knife, straw, box, string, cord, sheet, mat or other article made of, or containing, plastic."

Denmark Ban of all plastic bags (regardless of the 2015/720 Directive on lightweight plastic bags).

EPR SCHEME

Ghana: In 2004, the Government of Ghana created a Recycling Taskforce to hire waste collectors to collect and deliver plastic bags to warehouses for recycling. Plastics manufacturers are required to help fund the project.

TAX ON PLASTIC BAGS

South Africa: banned plastic bags under 30 microns and imposed a 46-rand cents levy on thicker bags. Violators are subject to a fine and imprisonment up to 10 years.

China: In 2008, China banned the "production, use and sale of ultrathin shopping bags", defined as bags less than 25 microns in thickness, and mandated that retailers impose fees on thicker bags

Cutlery, straw and stirrers

PUBLIC POLICIES

Balearic Islands: Majorca, Menorca and Ibiza plan to ban the sale of plastic cutlery and straws by 2020, except the ones that can be proved to be 'easily recyclable' or biodegradable.

Scotland plans to ban plastic straws by end of 2019.

Belgium: tax passed in 2007 on plastic films (such as dry cleaning bags), aluminum foil, and disposable cutlery.

UK Green Public Procurement: Plan to ban plastic bottles + plastic straws from Royal Estates.

France Ban of disposable plastic plates from 01/01/2020 (exception for home compostable ones and/or partly or fully made of bio-based plastics);

California: Assembly Bill introduced on January 17, 2018 aiming at making a criminal offense for restaurant employees to provide patrons with single-use plastic straws (up to six months jail and $1,000 fine). Measure would only apply to sit-down restaurants, and not fast food or similar locations.

Miami Beach (Florida-US): city ordinance in 2012 prohibiting beachfront hotels from serving drinks with straws.

R&D

Simplo: Start-up that uses SFC-certified wood particles to produce elegant and lightweight disposable utensils. They are 100% biodegradable, reduce loss of raw material, improve transport efficiency and can include publicity or messages targeting the end user. As the cutlery comes attached, SIMPLO also avoids the use of a plastic wrap to keep the cutlery utensils together.

The Plastic Straw: Project created by the Plastic Pollution Coalition and that lists on this page about twenty alternative solutions to plastic straws: paper straws, glass straws, steel straws, titanium straws, bamboo straws, etc.

RAISING AWARENESS

The Last Straw Petition: On Change.org, newspaper The London Evening Standard is calling on all food and drink businesses across London to ban plastic straws or draw up plans to phase them out by the end of 2018.

The Final Straw Campaign: spearheaded by Josie and Rob da Bank, founders of Bestival, aims to 'purge plastic straws from the festival landscape', starting with their own events – Bestival, Camp Bestival and Common People. They then aim to eradicate all single-use plastics – like cups and cutlery – at festivals in the following years.

VOLUNTARY AGREEMENT

Iceland (Supermarket): The Company has already removed plastic disposable straws from its own-label range.

Waitrose (Supermarket): announced that it will stop selling packs of disposable straws from September 2018.

Wetherspoons (Pub chain): is replacing plastic straws with biodegradable paper straws.

Northlink (Ferry Operator): is replacing plastic straws with paper ones on all its sailings.

Diageo (spirits producer): has committed to phasing out the use of all plastic straws and stirrers from its offices and by 2020.

Balloons and balloon sticks

RAISING AWARENESS

Balloons Blow: NGO that organises balloon clean-up on beaches, prevention of mass balloon releases, and promotion of alternatives to balloons and communication of information about current legislations essentially in the US on intentionally releasing balloons.

Netherlands: Study on the environmental impact of balloon in the environment: approximately one million balloons were launched in 2014 in the NE. Scan analysis shows that over 50% of societal costs related to balloon originate from the cleaning cost in the end-of-life phase.

PUBLIC POLICIES

UK: Oxford, Brighton, Plymouth, Shetland and Worcester have banned balloon releases on their lands (in open-spaces and parks)

USA: In 2017, the State of New-Jersey introduced a Bill prohibiting intentional release of balloons inflated with lighter-than-air gases. Florida and Virginia have also banned balloon releases.

Australia: In Queensland, the release of balloons into the environment is considered littering under the *Waste Reduction and Recycling Act 2011*—whether released deliberately or by accident.

Under the WRR Act, if a person fails to comply with a compliance notice they may face further penalties.

Food containers including fast food

VOLUNTARY AGREEMENT/COMMITMENT

Mark&Spencer: committed in its Plan A 2020 to drastically reduce plastic packaging from its aisles, including with the creation of a Food Packaging Charter.

- All PVC was removed from food packaging by 2000.

- Development of a safe system for the use and labelling of recycled materials in plastics.

- Since 2004, M&S has used 8,000 tonnes of recycled PET (rPET) plastic across produce, food-to-go, chilled drinks and deli products. During 2007- 2008, 63% of PET packaging contained a minimum of 50% post-consumer waste. This was further extended to the plastic films on packs.

- In 2007, M&S replaced foamed plastic trays across all apple and hard pears and it has been extended to all stone fruit and soft pears.

- Important cooperation with charity organizations Waste and Resources Action Programme (WRAP) & Marine Conservation Society (MCS).

Mcdonald's: By 2025, 100 percent of the company's guest packaging will come from renewable, recycled or certified (preferably by the Forest Stewardship Council) sources. By 2020, the company intends for 100 percent of its fiber-based packaging to come from recycled or certified sources where no deforestation occurs. As part of this goal, McDonald's will eliminate the use of polystyrene foam packaging globally by the end of 2018 + goal to recycle 100 percent of its restaurant packaging.

Iceland (Supermarket): committed in January 2018 to replace all plastic packaging from its own-brand products with fully recyclable paper and pulp-based alternatives by 2023.

Waitrose (Supermarket): From the end of 2018, all Waitrose own-label meat, fish and produce will no longer be packaged in black trays. The company has already removed 65 percent of black plastic packaging from fresh fruit and vegetables. By 2025, Waitrose intends to make all its brand-owned packaging widely recyclable, reusable or compostable. Since 2009, it has reduced its overall packaging by nearly 50 percent.

R&D

Pulpworks: Company that designs and manufactures sustainable packaging: compostable products, moulded from 100% post-consumer waste paper and agricultural waste such as bagasse (sugar cane), bamboo, wheat straw and renewable plants like switch grass. It is compliant with ISO 14000 and European Green Dot standards, facilitating internationalization. PulpWorks was the Grand Prize Winner at the 2013 "Think Beyond Plastic" competition sponsored by the international Plastic Pollution Coalition, at the 2014 North Bay Innovation Summit.

Miwa: introduces a digital solution that connects all stakeholders along the value chain – from the farm that produces the food to the customer that buys it. It allows anyone with a mobile phone to order any desired amount of a product to be delivered in reusable packaging to either their nearest store or directly to their home.

The **Fraunhofer Institute for Silicate Research ISC** has developed a coating with silicate and biopolymers that can be used in many different food packaging applications protecting biopolymer packaging and food against premature degradation and is fully compostable. https://newplasticseconomy.org/innovation-prize/winners/fraunhofer-institute-for-silicate-research

PUBLIC POLICIES

France: system currently in place in France, where supermarkets are taxed less for using sustainable and recyclable packaging, and more for using materials that aren't.

UK Considered taxes and charges on single-use items such as takeaway containers;

Vanuatu: Polystyrene takeaway boxes will be banned end of January 2018.

Zimbabwe: outlawed styrofoam containers for fast food. Ahead of implementation, snack bar owners were encouraged to offer their customers a place to sit in and eat.

Cup and cup lids

PUBLIC POLICIES

Ireland: Cork City Council banned in January 2018 single-use coffee cups from their canteens and offices.

Meath County Council replaced disposable cups for all staff in 2015.

Balearic Islands: Majorca, Menorca and Ibiza plan to ban the sale of plastic cups by 2020, except for the ones that can be 'easily recyclable' or biodegradable.

United Kingdom: according to the government, all disposable coffee cups should be recycled by 2023.

British MPs proposed to impose a 25p "latte levy" on every disposable coffee cups (under discussion).

France Ban of disposable cups/glasses from 01/01/2020 (exception for home compostable ones and/or partly or fully made of bio-based plastics).

REUSABLES

Cup Club is the world's first reusable coffee cup system. With smart cups available at coffee shops, easy-to-find drop-off points and high-tech wash hubs that deliver the cups to the coffee shops again, Cup Club is an easy, free and extra-large extra-hot step towards sustainable living. http://www.cup-club.co.uk/

Freiburg (Germany): Freiburger Abfallwirtschaft und Stadt-reinigung (ASF), a public-private partnership between REMONDIS & the City of Freiburg, has developed the Freiburg Cup and a strategy to reduce waste together with café operators. The most important partners of the Freiburg Cup are the operators of cafés and bakeries that sell coffee to go. As an alternative to disposable coffee cups, the ASF produces its reusable cups from stable plastic that holds up in dishwashers. Café businesses do not incur any costs, the City of Freiburg is bearing the costs for launching the system, while coordination is in the hands of the ASF. The deposit on the Freiburg Cup is 1 euro. Used cups can be returned at any one of the 60 businesses in the inner city taking part in the initiative. The cups are washed there, with defective or missing cups being replaced by the ASF.

Pret A Manger: has set a discount of 50p on hot drinks for customers who use reusable cups

Starbuck: in up to 25 London stores, will start a three months trail from February 2018 of 5p charge for disposable cups.

The Eden Cafe: Otago Polytechnic University in New Zealand banned single-use cups and provided second-hand china instead. These cups can be left at drop-off sites dotted around the campus where they are collected, washed and reused.

Hamburg (Germany): system for reusable to-go coffee cups since 2016. Customers pay €1.50 (about $1.63) to obtain a black "Refill It!" cup made from biodegradable, plant-based lignin. They fill it up with the beverage of their choice at one of 11 cafes participating in the programme. When it's empty, they can fill it up again or return it and get their money back.

Festival Republic (a leading UK music events producer): Introduced a £2 deposit on each reusable cup, which people get back when returning the cup to the bar.

RAISING AWARENESS

NGO Hubbub: bins shaped like giant coffee cups branded with 'Recycle your coffee cup here'.

Responsible Coffee Label: In Australia, participating cafes get a poster, an information sheet outlining the issue of single-use cups, and bi-yearly metrics on the benefits of the programme. An online map features the closest "responsible cafes" committed not to sell any disposable coffee cups.

R&D
TrioCup, a on-the-go coffee cup with an origami-style no-spill lid https://cooper.edu/engineering/news/100k-innovation-prize-awarded-former-invention-factory-winners

3.5.2 Examples of good practice related to fishing gear

Product design

Netherlands: Under the Green Deal for Fishing in Support of a Clean Sea there is significant effort put into research into alternatives to the use of dolly ropes. In 2017 Phase 5 of the Dolly Rope Free project was finalised and will be followed with a testing phase of alternative materials (i.e. yak leather, biodegradable rope, polyethylene ropes, etc.). Once the most suitable material has been identified, the commercial market is expected to take over follow-up developments.

Voluntary agreement for collection systems

Iceland: Voluntary agreement on collection of fishing gear made of synthetics between the Federation of Icelandic Fishing Vessel Owners (LIU) and The Icelandic Recycling Fund (since 2005 based on Art.8 Processing Charge Act No. 162/2002). LIU (now Fisheries Iceland) operates and finances a collection system. Under this agreement, fishing nets made of synthetic materials are exempted from recycling fees. The collected nets are mostly exported and recycled abroad.

Estimated recovery of fishing nets today: 80%, thanks to continuously increasing recycling targets.

Norway: Nofir: private nationwide company which collects discarded equipment from fishing and fish farming around Europe. Supported since 2012 by the EU Eco Innovation Scheme, it was created in 2008 by a fish net producer and a waste management company. Between 2012 and 2014 the Norwegian system had collected 4886 tonnes of material, mainly in Norway.

Extended producer responsibility

It makes the manufacturer responsible for the recycling/reuse treatment of their fishing gear products. In effect, this removes the inconvenience and cost factors associated with waste management from the fishers.

Norway: In Norway, the Ministry of Climate and Environment has announced their goal to introduce a producer responsibility scheme for fishing and discarded marine equipment from the aquaculture industry.

Deposit refund systems

The consumer pays a deposit upon the purchase of fishing gear, fish boxes, etc.. Once the gear reaches the end of life stage, the consumer could return the net and retrieve the deposit that would otherwise be burned, dumped or irresponsibly managed. No systems are currently known to be in place for fishing gear.

Reward schemes

Similar to "litter retrieval" and "litter retention" programmes, these "gear buy back" schemes encourage fishermen or other authorities to collect marine litter and bring it back to shore for a reward and appropriate disposal. No volunteer basis like for the other programmes.

A recycling initiative could offer the same kind of reward system, but the source of money would be from the recycling market itself instead of taxes from local or regional governments.

Hawaii: Pilot project → fishers are asked to report derelict fishing nets at sea. A team of trained volunteers then go to the reported location and remove the fishing gear. Once the gear is professionally retrieved, the commercial fishers are awarded cash according to the weights of the reported derelict nets or gear (Brink et al., 2009).

South Korea: programme within which fishers are responsible for reporting and retrieving the gear themselves. The programme provides fishers with durable bags to collect fisheries-related marine litter while at sea. The budget for this programme is shared between the central and local governments (Macfayden et al., 2009).

"No-fault" approach

Washington: In 2002, the Washington State legislature passed State Senate Bill 6313, establishing the Derelict Fishing Gear Removal Program, which is responsible for removing derelict gear from Puget Sound. The programme includes a popular method of reporting which takes a no-fault approach. A "no-fault" approach focuses on cleaning up the gear rather than focusing on who is responsible for losing it

Anti-dumping laws

China: China is a party to MARPOL, including Annex V, and has implemented national legislation in accordance with its regulations. China has passed an environmental protection law, which includes anti-dumping provisions. The law prohibits any dumping of garbage from vessels, specifically stating that "[n]o unit is permitted, without approval of the State competent authority being in charge of marine affairs, to dump any wastes into the sea areas under the jurisdiction of the People's Republic of China." Any vessels wanting to dump waste in the Chinese marine environment must obtain a permit.

Namibia: Regulations Relating to the Exploitation of Marine Resources. A fisher in Namibia "may not, without a written authorization by the Minister, leave any fishing gear or any other non-biodegradable object utilized for harvesting marine resources on or in the sea or on the sea shore on the termination of harvesting." If a fisher does lose or abandon their fishing gear, they will incur all costs relating to the collection of the gear and if the State recovers the gear, the fisher will then be indebted to the State.

South Africa: Fishing line recycling bins on beaches. PVC pipes were converted into bins that were erected on beaches. These pipes are resistant to the elements and corrosion and prevent the lines from blowing away. www.plasticsinfo.co.za

Port waste management systems

Norway: PRF Directive/Norwegian Pollution Control Act requires ports to charge vessels "indirect" waste handling fees. In this indirect port fee system, all vessels pay a set amount to use the port and its waste handling services. This means that all vessels pay the same no matter how much waste the vessels bring back to the port for disposal. = Lower administrative burden to calculate the amount of waste and no incentive to reduce one's waste by throwing it aboard.

Netherlands: Since 2016, sea-going vessels have been able to dispose of plastic waste' free of charge in the ports of Rotterdam Rijnmond and the North Sea Channel district. The waste must be presented separated and clean. The port authorities of Rotterdam and Amsterdam agreed on this with the waste collectors in the ports.

This action was implemented as part of the Green Deal Ships' Waste Supply Chain that the Minister for Infrastructure and the Environment, Schultz van Haegen, entered into with the sector on.

10 September 2014. Participants in the Green Deal: Port of Rotterdam Authority, Port of Amsterdam, Zeeland Seaports, Groningen Seaports, Port of Den Helder, NVVS (ships' suppliers), KVNR (ship owners), collectors of ships' waste, ILT and Stichting De Noordzee.

The Green Deal has been operating for three years and the separate collection of plastic ships' waste has grown steadily. Extra quality requirements have been incorporated into new and renewable licences for waste collectors when it comes to collecting, sorting and recycling plastic. In addition, Dutch and Flemish ports have agreed on a joint financing system for the waste collection.

The Deal focuses on the implementation of a number of measures, with varying levels of progress. The measures to improve the removal of operational maritime waste and domestic waste, and the fine-tuning of port-based collection facilities has resulted in all fisheries ports being able to facilitate the collection of segregated waste streams. However, disposing end-of-life fishing gear in ports is still problematic. To attempt to solve this issue, a location-sensitive mobile app for fishers will be launched, which enables seafarers to notify port authorities of the type and quantity of waste they will bring ashore ahead of landing. The app also reminds fishers to prepare and dispose of their waste properly.

Penalty scheme

This scheme would impose a penalty on a vessel that does not discharge any waste at port (meaning they did it at sea)

Environmental tax

Internalizing the environmental costs of fishing and aquaculture by increasing the final product's selling price. The government could achieve this by implementing an environmental tax.

Raising awareness

AUSTRALIA: The Caring for our Country initiative jointly administered by the Department of the Environment, Water, Heritage and the Arts and the Department of Agriculture, Fisheries and Forestry, Projects include: "ghost net" cleanup projects across northern Australia; regional and local marine debris monitoring and cleanup, including education and awareness raising; and industry initiatives.

Gear marking

Identification marking, which helps in identifying the ownership of lost or deliberately abandoned gear. → Authorities can better enforce penalties for intentionally dumping fishing gear and nets into the sea. It also creates an opportunity to return gear that was accidentally lost to the owner for reuse. + To increase the visibility of gear. For example, floating gear markings attached to stationary nets under the surface can help notify vessels about the risk of entanglement in the area (see above reference to FAO guidelines adopted in February 2018).

Norway: the Norwegian Resources Act does require fishers in Norway to mark their stationary gear for visibility and identification purposes.

Washington: Washington State Department of Fish and Wildlife has established guidelines to minimize the likelihood of lost crab pots: each pot must be clearly marked, attached to a buoy, and have a biodegradable panel to allow marine life to escape if it does become abandoned

Navigational technology

Fishers can avoid accidental gear loss by attaching tracking devices, called transponders. These transponders use either radio channels or satellite systems to communicate their location in the water to the vessel.

Retrieval schemes

Global Ghost Gear Initiative: GGGI is a global organisation aiming to tackle the problem of ghost fishing gear. They work in collaboration with a number of retrieval schemes, such as **Ghost Fishing** in The Netherlands, **MCB Seafoods** in the United Kingdom, project **GHOST**, aiming to reduce the impacts of ALDFG in the coastal areas of the north Adriatic Sea and more.

Waste Free Oceans: WFO collaborates with fishers and brand owners to retrieve and recycle marine litter (including fishing gear) into new products.

Blastic: This project (2016-2018) is co-funded by the European Regional Development Fund and takes regional and national strategies into use on a local level and also produces updated local action plans (including retrieval schemes) to reduce the plastic (also from fishing gear) into the Baltic Sea.

Fishing for litter

Germany: In 2012 a cooperation between Naturschutzbund (NABU) and Niedersachsen Wattenmeer National Park has developed a Fishing for Litter scheme. In two years, the cooperation landed more than 6 tons of litter, of which 80 % was plastic, 13 % rubber, and 9 % metal. NABU also developed other Fishing for Litter programmes in the North Sea.

Netherlands: Under the Green Deal for Fishing in Support of a Clean Sea the fishing for litter initiative continuous to receive direct funding from the government. From 2019 funding will decrease, with the aim of allowing the fishing sector to take over the initiative. This will also be a build-up to the implementation of the new Port Reception Facilities Directive in 2020.

Marineclean: Running between 2011 and 2014 this project targeted the reduction of marine litter through collection of marine litter with new light equipment produced at Turna. Other activities included production of edible and biodegradable packaging produced at EcoCortec;

through fishing nets produced at Turna and TC PoliEko that can be easily traced, collected and recycled when lost; and through advocacy.

KIMO: This organisation is an association of coastal local authorities whose goal is to eliminate pollution from the Northern Seas. KIMO has 75 member authorities from the UK, Sweden, Denmark, The Netherlands, Belgium, Lithuania, Estonia, Germany, Faroe Islands and the Isle of Man.

Recycling of Fishing Gear

Plastix Global: This Danish company recycles discarded fishing nets and trawls into reusable green raw materials such as HDPE, PP and PA. In 2016, the company had a capacity of 12 000 tons per annum, Plastix is one of the few recycling companies capable of recycling most of the material in fishing gear. For this reason, a number of schemes have partnered up with the company.

MCB Seafoods Recycling Scheme allows fishers in ports of Newhaven, Shoreham and Eastbourne (UK) to deposit their end-of-life fishing gear free of charge, which is then collected and sent for recycling to Plastix.

Nofir: Based in Norway with facilities in Turkey and Lithuania, Nofir recycles discarded plastic equipment from fishing and aquaculture and regenerates it into ECONYL yarn to use for new textile products (i.e. clothes, furniture, carpets, etc.). Between 2011 and 2016 the company collected and recycled 26314 tons of end-of-life fishing gear.

Aquafil: The company is based in Italy with headquarters in Slovenia, Croatia, Germany, UK, USA, Thailand and China. It recycles fishing gear and turns it into yarn used in the production of carpets. Similarly to Plastix, the company is in partnership with various organisations.

Gwr Polymers Ltd collects and transports baled nets to Slovenia, and recovers costs by selling on the regenerated pellets.

Ecoalf: This company uses nylon made from discarded fishing nets and turns it into fashion products.

Bureo: This American company based in Chile recycles discarded fishing nets and turns it into skateboards and toys. They have recycled more than 80 000 kg of discarded materials up to today.

Intco Environmental Protection Machinery: INTCO developed Greenmax Machines, a recycling unit that recycles fish cooling boxes made from Styrofoam (EPS) and turns it into high-quality EPS blocks. The company has a buy-back scheme, making the purchase of such a unit financially sustainable for a company.

Nets-To-Energy: This programme in Hawaii, USA collects fishing nets and then transports it to a scrap-metal recycler facility. Here the nets are chopped into small pieces suitable for combustion at the City and County of Honolulu's H-Power Energy from Waste Facility.

Net-Works: The project empowers coastal communities in developing nations to collect and sell discarded fishing nets, which are recycled and turned into yarn to make carpet tile.

4 GLOBAL ACTION

4.1 Existing actions involving EU

4.1.1 Multilateral cooperation at the United Nations and through environmental agreements

The United Nations Environment Assembly (UNEA) has consistently highlighted marine plastic debris and microplastics amongst the issues of global importance. At the second UNEA session (UNEA-2) in 2016, resolution UNEP/EA.2/Res.11 on marine plastic litter and microplastics was adopted, in which governments requested an assessment by the United Nations Environment Programme (UNEP) of the effectiveness of relevant international, regional and sub-regional governance strategies and approaches to combat marine plastic litter and microplastics, taking into consideration the relevant international, regional and sub-regional regulatory frameworks. The resolution called for identification of possible gaps a well as options for addressing these gaps.

The UNEP assessment[100], prepared in response to the aforementioned UNEA-2 resolution, highlights that in the current set-up there is no global institution with the mandate to coordinate current efforts and manage the issue upstream from the extraction of raw materials, design and use phases of plastic polymers and additives to final treatment and disposal. Also, among a number of other conclusions, it notes the lack of harmonised binding standards at the global level for the mitigation of pollution by plastic waste, particularly from land-based sources; a lack of global standards for national monitoring and reporting on consumption, use, final treatment and trade of plastic waste, as well as a lack of global industry standards for environmental controls and quality specifications of plastics. Concerning in particular liability and compensation from damages resulting from marine litter, the UNEP assessment notes that, despite the widespread damage resulting from marine litter, liability and compensation for damage to the marine environment from accidental or intentional discharge of solid material in the sea is not covered by any international instrument. The existing instruments that apply in the context of marine litter and microplastics have geographical limitations as they fail to cover internal waters and watersheds. The costs of remediation for environmental damage by marine plastic litter and microplastics are not currently represented in any product or any other liability legislation with potential compensatory arrangements for environmental damage. Furthermore, the assessment underlines that extended producer liability and any other appropriate schemes (e.g. liability and financial compensation schemes for the shipping sector) would need to be used to induce change in the plastic producing industries. Next to suggesting consideration of the overall governance set-up to UNEA, the assessment proposes a number of areas and steps in need of immediate progress. This comprises to give consideration, in the context of marine plastic litter and microplastics, to the definition of damage, the measure of damage, responsibility, who can claim and what remedial activities can be claimed for.

Moreover, several initiatives have been launched to address specifically the impacts of plastic waste entering the sea from land and include *inter alia*: UNEP's Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) and the

[100] UNEP (2017), Combating marine plastic litter and microplastics: An assessment of the effectiveness of relevant international, regional and subregional governance strategies and approaches (EA.3/INF/5)

Global Partnership on Marine Litter (GPML)[101], the 2015 G7 Action Plan to Combat Marine Litter[102], and the 2017 G20 Marine Litter Action Plan[103].

Concerning plastic waste and other types of waste discarded from ships, the International Maritime Organisation (IMO) has also developed action to address the issue, in particular by further regulating the discharges of garbage from ships in the context of the MARPOL Convention[104]. Annex V to MARPOL prohibits the discharge of all types of garbage into the sea from ships, except in the cases explicitly permitted under the Annex (such as food waste, cargo residues, cleaning agents/additives that are not harmful to the marine environment). MARPOL also recognizes that some sea areas require higher degrees of protection and can be designated as Special Areas under MARPOL. Garbage from ships includes all kinds of food, domestic and operational waste, and comprises all plastics as well as fishing gear. Annex V applies to all types of ships operating in the marine environment, including fishing vessels and recreational craft. Yet, although MARPOL provides comprehensive framework addressing ship-source pollution from different polluting substances, it does not provide for a compliance mechanism. The success of compliance with the MARPOL discharge norms depends on the availability of adequate port reception facilities where the garbage can be delivered and managed appropriately. The EU Port Reception Facilities Directive[105] transposes these requirements into EU law through a ports based approach, is instrumental for implementing and enforcing the MARPOL regime, including its ban on plastic discharges.

The EU takes an active part in the decision-making processes under the relevant multilateral environmental agreements (MEAs) and processes that set legally binding requirements and provide guidance for all countries, e.g. on chemicals and waste management[106]. In particular, under the Basel Convention[107], Parties have adopted a number of measures including an Environmentally Sound Management (ESM) toolkit that they can use in shaping their national policies to ensure a sound management of waste, so contributing to achieving the SDGs. The ESM toolkit consists of practical manuals on waste management and fact sheets covering specific waste streams; and guidance for developing efficient strategies on waste prevention[108]. It includes incentives to encourage private sector investments, training materials, checklist for self-assessment of national capacity, pilot projects, ESM criteria and case studies on the promotion of ESM in the informal sector. At the 13th meeting of the Conference of the Parties to the Basel Convention (COP13 held in April 2017), Parties have engaged in developing new tools, such as a practical manual on extended producer responsibility (EPR), guidance on waste prevention and minimisation, factsheets on specific waste streams and manuals on EPR and financing systems for ESM. Another outcome of COP13 was the establishment of a new household waste partnership[109] and the inclusion of

[101] https://www.unep.org/gpa/what-we-do/global-partnership-marine-litter
[102] https://www.g7germany.de/Content/EN/_Anlagen/G7/2015-06-08-g7-abschluss-eng_en.html
[103] https://www.g20.org/Content/DE/_Anlagen/G7_G20/2017-g20-marine-litter-en.html?nn=2186554
[104] http://www.imo.org/en/about/conventions/listofconventions/pages/international-convention-for-the-prevention-of-pollution-from-ships-(marpol).aspx
[105] Directive 2000/59/EC on port reception facilities for ship-generated waste and cargo residues
[106] London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter; Basel Convention on the Control of Transboundary movements of Hazardous Wastes and their Disposal; Stockholm Convention on Persistent Organic Pollutants; Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade; etc.
[107] Basel Convention on the Control of Transboundary movements of Hazardous Wastes and their Disposal
[108] http://www.basel.int/Implementation/CountryLedInitiative/EnvironmentallySoundManagement/Overview/tabid/3615/Default.aspx
[109] http://www.brsmeas.org/?tabid=4332&blogId=5148

marine plastic litter and microplastics in the work programme of the Basel Convention's Open-ended Working Group[110] for 2018-2019.

Parties under the Convention on Biological Diversity have adopted decision XIII/10 to prevent and mitigate the potential adverse impacts of marine debris on marine and coastal biodiversity and habitats[111]. The decision invites Parties and other governments to consider extended producer responsibility for providing response measures where there is damage or sufficient likelihood of damage to marine and coastal biodiversity and habitats from marine debris.

4.1.2 G7 and G20

Both the G7 and now also the G20 have addressed the issues of resource efficiency and marine litter. Concerning resource efficiency, the G7 Alliance on Resource Efficiency[112] is a forum to share knowledge and create information networks, in collaboration with businesses, SMEs, and other relevant stakeholders. The objective is to advance opportunities offered by resource efficiency, promote best practices and foster innovation, including through innovative public private partnerships and by collaborating with developing countries. The Toyama Framework on Material Cycles[113] provides a common vision and a guide for future actions to deepen G7 efforts on resource efficiency and the 3Rs (reduce, reuse, recycle). The Five-year Bologna Roadmap on resource efficiency[114] was a key deliverable of the 2017 G7 Environment Ministers' Meeting drafted with the active involvement of all G7 countries and the EU. It contains a specific reference to plastics[115]. The current Canada presidency of G7 is proposing that the G7 will adopt a "Plastics Charter" addressing marine litter. The G20 Resource Efficiency Dialogue[116] aims at supporting the transition to a sustainable and efficient use of all natural resources and contributing to poverty eradication, acknowledging that an efficient and sustainable use of natural resources is vital for implementing the SDGs. The work on resource efficiency in both the G7 and the G20 is of particular interest to the EU because of its own domestic action on a transition towards a circular economy. As to marine litter, the G7 Action Plan to Combat Marine Litter[117] commits G7 members to priority actions and solutions to combat marine litter and stresses the need to address land- and sea-based sources, removal actions, as well as education, research and outreach. A similar approach has recently been adopted by the G20 through the G20 Action Plan on Marine Litter[118], where the G20 recognised the urgent need for action to prevent and reduce marine litter in order to

[110] For more info on the Basel Convention's Open-ended Working Group see: http://www.basel.int/TheConvention/OpenendedWorkingGroup(OEWG)/OverviewandMandate/tabid/2295/Default.aspx
[111] https://www.cbd.int/doc/decisions/cop-13/cop-13-dec-10-en.pdf
[112] https://www.g7germany.de/Content/EN/_Anlagen/G7/2015-06-08-g7-abschluss-annex-eng_en.pdf?__blob=publicationFile&v=2 (pp. 6-8)
[113] http://www.mofa.go.jp/files/000159928.pdf
[114] http://www.g7italy.it/sites/default/files/documents/Communiqu%C3%A9%20G7%20Environment%20-%20Bologna_0.pdf (pp. 13-15)
[115] 'Assess the economic benefits and opportunities for improved product design and address barriers to recycling and reuse of plastic, in view of reducing the use of primary resources, the negative environmental and economic impacts over its life-cycle and avoid plastics leakage into the environment, in particular the seas and oceans (in coordination with relevant G7 work)'.
[116] https://www.g20.org/Content/DE/_Anlagen/G7_G20/2017-g20-resource-efficiency-dialogue-en.pdf?__blob=publicationFile&v=4
[117] https://www.g7germany.de/Content/EN/_Anlagen/G7/2015-06-08-g7-abschluss-eng_en.html
[118] https://www.g20.org/Content/DE/_Anlagen/G7_G20/2017-g20-marine-litter-en.html?nn=2186554

preserve human health and marine and coastal ecosystems, and mitigate marine litter's economic costs and impacts.

4.1.3 Bilateral and regional cooperation

Prevention at source will be key to tackling the rising plastic waste tide, in line with the EU's circular economy approach. This will require the promotion of a circular plastics economy in third countries through policy dialogues on environment, industry and trade. The Commission has regular policy dialogues on e.g. environment[119] with partner countries (notably those members of the G20, including China and India) and is in the process of developing such dialogues also with key regional organisations, such as the Association of South East Asia Nations (ASEAN). Beyond policy dialogues, the cooperation mechanisms established under Free Trade Agreements and in particular their Trade and Sustainable Development Chapters [120] and the Generalised Scheme of Preferences[121] can also be used for these purposes.

4.1.4 Relevant EU policies and programmes with an international dimension

The EU organised events

The European Union hosted the fourth high-level Our Ocean Conference[122] in Malta on 5 and 6 October 2017. The Conference has generated 437 concrete and tangible commitments for safe, secure, clean and sustainably managed oceans. Out of the 437 commitments in total, more than one hundred commitments (worth almost €3bn), were related to marine pollution including actions targeting plastics, which was one of the main themes of the event.

Development Cooperation

The EU supports improved and sound waste management in third countries through its bilateral and regional funds. From 2006 till 2013, the EU has dedicated €238 million to finance projects for water treatment, sanitation and waste management, a large part of which contributes to the circular economy. Building on this, the EU has committed to further €202 million for the timeframe 2014-2018.

The EU SWITCH to Green programmes (Switch Asia, Switch Africa Green and SwitchMed[123]) supporting sustainable consumption and production (SCP) practices are one of the main EU contributions to the circular economy in partner countries. They also contribute to SDG 12 ('Ensure sustainable consumption and production patterns') and a number of other relevant SDGs. They cover a large range of key economic sectors in developing countries, for example agri-business, garments, manufacturing, construction materials, and SCP practices, including resource efficiency, eco-innovation, green products design, green products consumer demand, and green public procurement. They deliver policy support, promote green business development and facilitate networking among green businesses and with policy makers.

The programmes contribute to address plastic issues. The NEERE project in Burkina Faso for example, under SWITCH Africa[124] promotes eco-entrepreneurship through better waste

[119] http://ec.europa.eu/environment/international_issues/index_en.htm
[120] http://ec.europa.eu/trade/policy/countries-and-regions/negotiations-and-agreements/
[121] http://ec.europa.eu/trade/policy/countries-and-regions/development/generalised-scheme-of-preferences/
[122] http://ourocean2017.org/
[123] On Switch-Med, see also section 0.
[124] www.switchafricagreen.org

management. Among others, it raises awareness on the impact of plastics pollution, supports plastic waste collection, and supports recycled plastics-based business development.

Enlargement and Neighbourhood Policies

Countries covered by the Enlargement and Neighbourhood policies are very valuable partners to promote circular economy and the Plastics Strategy, due to their political and historical proximity. EU action in these regions combines privileged political dialogues (e.g. sub-committee meetings) and assistance at regional and national level through institution building and financial instruments, including blending facilities. All these means could be further used to promote the circular economy objectives such as more recycling as well as a cost-efficient and effective waste management. This is all the more relevant for the candidates and potential candidate countries in the Western Balkans and Turkey, who have to comply with the EU environmental *acquis,* including revised legislative proposals on waste, upon accession.

Examples of EU action in these regions are:

- The regional ECRAN Programme has also helped the Balkan countries to transpose and implement the EU waste management acquis (Waste Framework Directive's requirements) and gradually move from dependence on landfills to separate waste collection and integrated waste management;
- A project on "Eco Awareness Campaign in Montenegro", took place from April to December 2017, tackling the use of plastic bags and related pollution issues;
- There are also two flagship projects of EU regional cooperation with neighbourhood countries on the promotion and support of sustainable consumption and production patterns in beneficiary countries: SWITCH Med (EUR 20 million; 2013-2018) and EaP GREEN (EUR 10M; 2013-2017);
- The programme Horizon 2020[125] aims at depolluting the Mediterranean Sea, addressing municipal waste, urban waste-water and industrial pollution.
- The Commission services organised high-level dialogues, to raise awareness on circular economy (Casablanca in October and Kiev in November 2017).
- The EMBLAS II project to improve monitoring in the Black Sea.

Since 2014 bilateral and regional funding for waste and water management in these regions amount to about €970 million. Projects include regional assistance as well as blending facilities. Large part of these resources is dedicated to the Instrument for Pre-Accession Assistance (IPA)[126].

The Commission services have organised or are organising some high level dialogues, to raise awareness on circular economy (Casablanca in October, Kiev in November, and Belgrade in December 2017). A high level event will also take place in 2018 in Tunisia with the participation of relevant Commissioners, in view of strengthening cooperation with partners to promote adoption and implementation of these approaches.

Policy Dialogues

Prevention at source will be key to tackling the rising plastic waste tide, in line with the EU's circular economy approach. This will require the promotion of a circular plastics economy in

[125] http://www.euneighbours.eu/en/south/eu-in-action/projects/horizon-2020-capacity-buildingmediterranean-environment-programme-h2020

[126] The Instrument for Pre-accession Assistance (IPA) is the means by which the EU supports reforms in the 'enlargement countries' with financial and technical help.

third countries through policy dialogues on environment, industry and trade. The Commission has regular policy dialogues on e.g. environment[127] with partner countries (notably those members of the G20) and world regions, such as the Association of South East Asia Nations (ASEAN). Trade partners can also be used to this end, in the context of free trade agreements[128] and the Generalised Scheme of Preferences[129].

The Partnership Instrument

The EU's ambitious Circular Economy Action Plan fully corresponds to the objectives of the Partnership Instrument[130], namely to support EU action on global challenges including by promoting EU innovative solutions, thereby supporting market access and jobs in the Union.

The circular economy creates the right conditions for the EU to accelerate the global transition to a resource efficient, low-carbon and circular economy, and boost the competitiveness of our businesses. Actions can include improving access to the country's markets by enhancing trade, investment and business opportunities for European companies who have already adopted circular design and business models.

In that respect, the EU has adopted, under the Partnership Instrument, a number of actions that support the circular economy and, indirectly, the EU Plastics Strategy. These include the China EU Water Platform (CEWP), the India-EU Water Partnership (IEWP), and the Resource Efficiency Initiative (REI) in India, which bring together expertise from the EU and its Member States experts, and strongly engage with the private sector.

Regional Seas Conventions

The EU is already actively cooperating with the Regional Seas Conventions protecting the marine and coastal environment in the four marine regions around Europe[131]. Regional marine litter action plans are in place in three regions, and under preparation in the Black Sea; A project supporting implementation of the Regional Plan against marine litter of the Barcelona Convention is ongoing[132].

The EU is a Contracting party to the Barcelona, OSPAR and HELCOM Conventions for the protection of the marine environment in the Mediterranean, the Northeast Atlantic and the Baltic respectively. The Commission, representing the EU in these Conventions has supported the adoption and implementation of action plans to combat marine litter in these marine regions. Their aim is to ensure coherent and efficient actions of the riverine countries to reduce marine litter and its impacts. Regular meetings take place for the coordination of the regional activities against marine litter among themselves, and with the implementation of MSFD at EU and national level.

[127] http://ec.europa.eu/environment/international_issues/index_en.htm
[128] http://ec.europa.eu/trade/policy/countries-and-regions/negotiations-and-agreements/
[129] http://ec.europa.eu/trade/policy/countries-and-regions/development/generalised-scheme-of-preferences/
[130] http://ec.europa.eu/dgs/fpi/what-we-do/partnership_instrument_en.htm.
[131] The EU is member of the OSPAR (Northeast Atlantic), HELCOM (Baltic) and Barcelona Conventions (Mediterranean) and provides support to the Bucharest Convention (Black Sea).
[132] http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/Marine_litter_med_project_20_4_2016.pdf

Efforts are being undertaken with each of the Conventions to ensure a synergetic application of the EU plastic strategy. The Commission also supports financially and technically the development of such an action plan in the fourth European marine region, the Black Sea[133].

A project supporting implementation of the Regional Plan against marine litter of the Barcelona Convention is ongoing[134]; in 2017 two big INTEREG projects (CleanAtlantic and Oceanwise) were launched, which contribute directly and substantially to the implementation of the OSPAR Action Plan against marine litter; a project on marine litter in Northern Periphery & Arctic region, dealing with the re-use of the lost fishnets is another example of how regional EU action supports entrepreneurship and efforts against marine litter (http://www.circularocean.eu/).

Table 17: Summary of existing measures regarding SUPs globally

Asia			
Bangladesh	Ban	Total ban on polyethylene plastic bags.	2002
Bhutan	Ban	Total ban on plastic bags.	2009
China – Jilin Province	Ban – Regional	Total ban on non-biodegradable plastic tableware (and bags) in the Jilin Province.	2015
Indonesia – Badung	Ban – Regional	Ban on the use of Styrofoam in the city of Badung.	2016
India - Karnataka	Ban – Regional	All Plastic – covers sale of plastic carrier bags, plastic plates/cups/spoons, and cling film.	2016
India - Delhi	Ban – Regional	All single use plastic items including plastic cups, bags, plates and cutlery, in the national capital territory area.	2017
Philippines	Ban	Ban on the sale and use of non-biodegradable plastic bags in >59 municipalities. Use of Styrofoam containers is prohibited in Manila.	2011
Sri Lanka	Ban	Ban on Styrofoam containers.	2017
Taiwan	Ban	Ban on beverage cups, straws, plastic bags and single use tableware.	2030
North America			
USA – San Francisco	Ban – Regional	Plastic water bottles on city properties.	2014
USA – New York City[135]	Ban- Regional	Ban on single-use Styrofoam containers in New York. The ban was challenged by a coalition of recycling firms and plastic manufacturers who claimed the material is recyclable. The ban was lifted in 2015 and reintroduced in 2017.	2013/ 2017

[133] Action Plan for the Mediterranean: http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/decision_21_7_marine_litter_mediteranien.pdf
Action Plan for the Atlantic: http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/atlantic_mlrap_brochure.pdf
Action Plan for the Baltic : http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/baltic_regional_action_plan_marine_litter.pdf
[134] http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/Marine_litter_med_project_20_4_2016.pdf
[135] Plastic Bag Ban Assessment DRAFT, IETC

USA – Washington D.C	Ban – Regional	On wet wipes labelled as flushable, unless it can be proven that they break down in normal sewer conditions.	2018
USA – Seattle, Washington, Portland, Oregon, Westchester, Berkeley and Malibu	Ban – Regional	Ban on styrofoam foodware.	Date not listed
USA – Laguna Beach and Santa Monica	Ban – Regional	Ban on polystyrene foodware.	Date not listed
USA - Seattle	Ban - Regional	Ban on plastic straws and plastic utensils.	2018
South and Central America			
Costa Rica	Ban	All single use plastics.	2021
Antigua and Barbuda	Ban	Total ban on the importation and use of plastic utensils and Styrofoam containers.	2019
Chile, Punta Arenas and coastal regions	Ban- Regional	Total ban on polyethylene bags in Punta Arenas. Total ban on the sale of plastic bags in 102 coastal villages and towns.	2014, 2017
Columbia	Ban	Ban on disposable plastic bags smaller than 30x30cm.	2016
Guatemala, San Pedro La Laguna	Ban - Regional	Total ban on plastic bags and Styrofoam containers in San Pedro La Laguna.	2016
Guyana	Ban	Ban on the import and use of Styrofoam items.	2016
Haiti	Ban	Ban on the import and production of plastic bags and Styrofoam containers.	2013
Jamaica	Ban	Ban on all non-biodegradable plastic bags below 50-gallon capacity and on Styrofoam containers.	2018
St Vincent and the Grenadines	Ban	Ban on the import of Styrofoam products, VAT removed from biodegradable alternatives to lower their costs.	2017
Australia/Oceania			
Australia, Hobart, Tasmania	Ban - Regional	Ban on plastic takeaway containers.	2020
Australia, Coles Bay	Ban - Regional	Ban on all non-biodegradable plastic bags.	2003
Australia, South Australia	Ban - Regional	Ban on lightweight plastic bags.	2009
Vanuatu	Ban Potential Ban	Ban on polystyrene takeaway boxes. Considering the introduction of a ban on the use and import of single use plastic bags and bottles.	2018 2018
Africa			
Benin	Ban	Total ban on import, production, sale, and use of non-biodegradable plastic bags.	2018
Cameroon	Ban	Total ban on non-biodegradable plastic bags.	2014
Cape Verde	Ban	Total ban on the sale and use of plastic bags.	2017
Eritrea	Ban	Ban on the import, production, sale and distribution of plastic bags.	2004
Guinea-Bissau	Ban	Total ban on the use of plastic bags.	2016
Kenya	Ban	Total ban on the import, production, sale and use of	2017

		plastic bags.	
Mali	Ban	Total ban on the production, import, possession, sale and use of non-biodegradable plastic bags.	2012
Mauritius	Ban	Ban on the import, manufacture, sale or supply of plastic bags.	2016
Morocco	Ban	Ban on the production, import, sale and distribution of plastic bags.	2016
Rwanda	Ban	Total ban on production, use, import and sale of all polyethylene bags.	2008
Tanzania	Ban	Total ban on all plastic bags.	2018
Zimbabwe	Ban	Total ban on Styrofoam products – was temporarily lifted after introduction to allow businesses time to replace Styrofoam containers with reusable, recyclable or biodegradable ones.	2017

4.2 Actions to be taken

4.2.1 UN Level

This year's third session of the United Nations Environment Assembly held in Nairobi on 4-6 December 2017, addressed the theme 'Towards a pollution-free planet'. UNEA-3 adopted inter alia a resolution tabled by Norway on marine litter microplastics and building on the above-mentioned UNEP assessment[136]. The resolution decided the establishment of an Ad Hoc Open Ended Expert Group to further examine the barriers to, and options for, combating marine plastic litter and microplastics from all sources, especially land based sources. This working group will report back to the fourth session of the United Nations Environment Assembly in 2019 with recommendations for further actions.

4.2.2 G7 and G20

The EU will continue its engagement with the G7 Alliance on Resource Efficiency and in particular the work on plastic identified in the Bologna Roadmap adopted by the G7 Environment Ministers' Meeting in June 2017, the G20 Resource Efficiency Dialogue, and support current and upcoming G7/G20 Presidencies in implementing the G7 Action Plan to Combat Marine Litter and the G20 Marine Litter Action Plan, adopted in July 2017, respectively.

In particular, the Commission services organise a G7 workshop on plastic management in Brussels in March 2018, open to G20 experts, to assess the opportunities for improved product design, address barriers to recycling and reuse of plastic, and avoid plastics leakage into the environment, in particular the seas and oceans.

4.2.3 EU international actions

The EU will support the adoption and implementation by third countries of environmentally sound waste management approaches (ESM) and strategies, inspired by the waste hierarchy

[136] UNEP (2017), Combating marine plastic litter and microplastics: An assessment of the effectiveness of relevant international, regional and subregional governance strategies and approaches

and by extended producer responsibility (EPR) approaches. Examples of international action supported by the EU are:

- The Commission services are working on a Partnership Instrument project for contributing to reducing plastic waste and marine litter in East and South East Asia to be adopted by the end of 2018.
- With EU support, the Inter-American Tropical Tuna Commission (IATTC) has become the first fisheries organization to adopt binding provisions on the recovery of Fish Aggregating Devices (FADs).
- In February 2018 the Commission took part in the FAO Technical Consultation that adopted the Report and the Voluntary Guidelines on the Marking of Fishing Gear and that are expected to be endorsed in July 2018.
- Development of international industry standards on sorted plastic waste and recycled plastics to facilitate trade in these secondary raw materials, while at the same time protecting workers' health and the environment (see above). Moreover, this will further allow for the development of a stronger EU position during coming discussions at international level given the existing Vienna Agreement between CEN and ISO.

EUROPEAN
COMMISSION

Brussels, 28.5.2018
SWD(2018) 254 final

PART 3/3

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT

Reducing Marine Litter: action on single use plastics and fishing gear

Accompanying the document

Proposal for a Directive of the European Parliament and of the Council on the reduction of the impact of certain plastic products on the environment

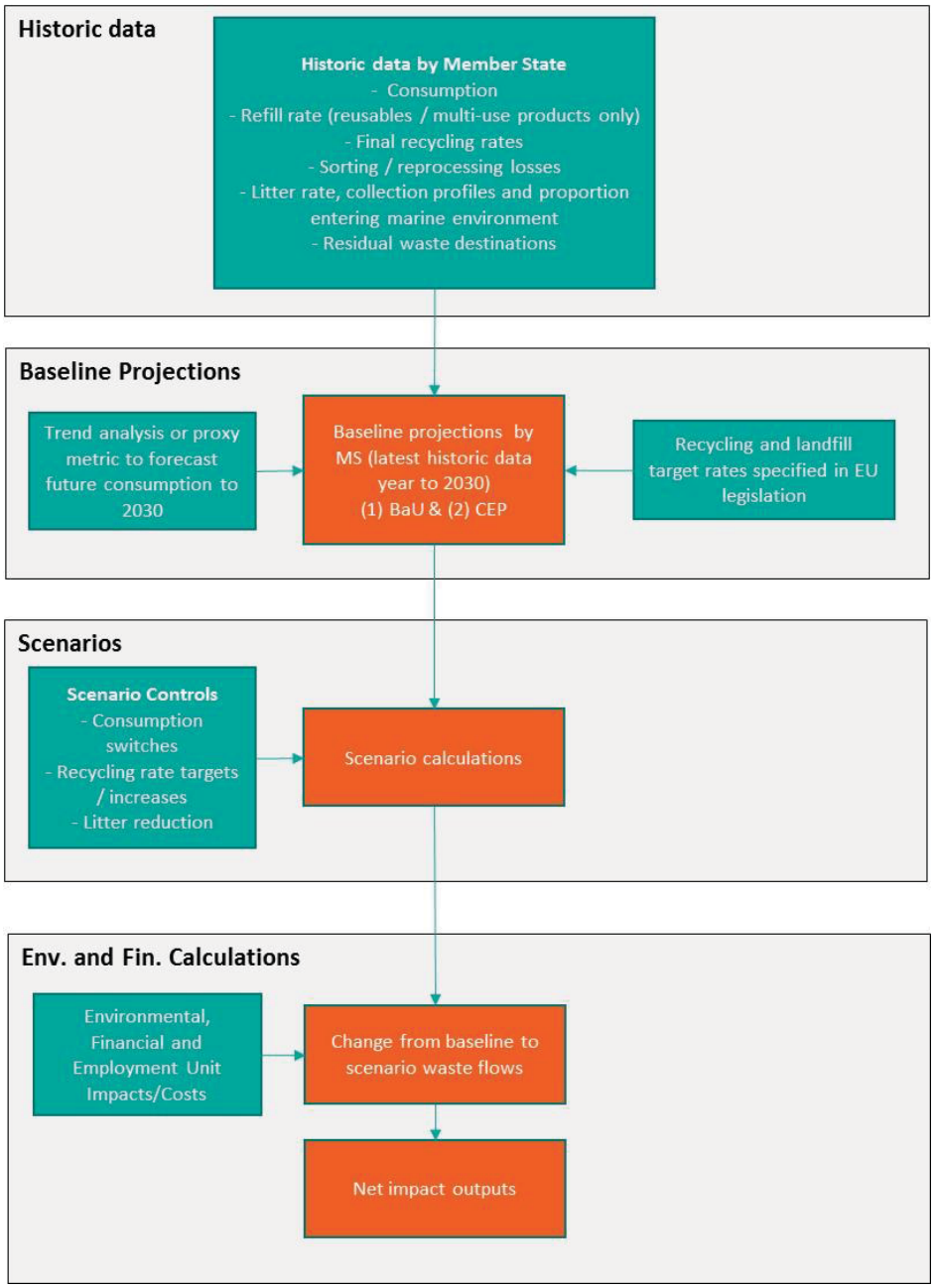
{COM(2018) 340 final} - {SEC(2018) 253 final} - {SWD(2018) 255 final} -
{SWD(2018) 256 final} - {SWD(2018) 257 final}

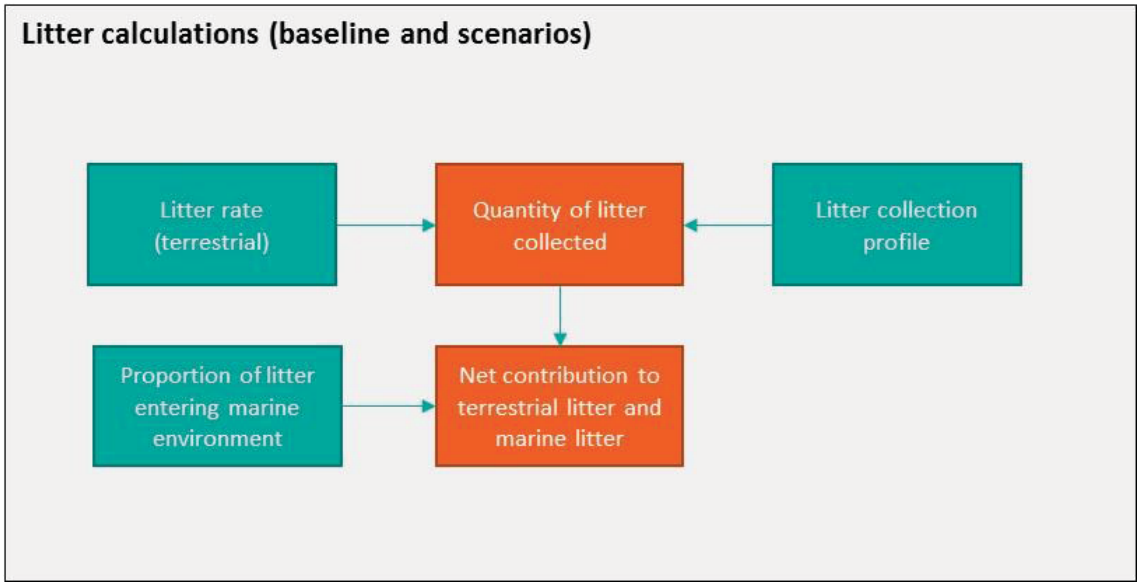
Contents

ANNEX 4: ANALYTICAL METHODS

1 SINGLE-USE PLASTICS

The main model used was developed by Eunomia, and reflects the core flow of calculations that are calculated for each Member State. The following overview highlights the basic model flow used to generate our calculations. These have been calculated for each Member State, Item and Type.





The model includes the following impact categories:

1. Greenhouse gas emissions:
   a. Manufacturing
   b. Refill Schemes
   c. Recycling
   d. Incineration
   e. Landfill
2. External costs:
   a. Manufacturing
   b. Refill Schemes
   c. Recycling
   d. Incineration
   e. Landfill
   f. Land based litter
   g. Marine litter
3. Financial costs:
   a. Consumer's Purchases
   b. Retailer Sales
   c. Producer Turnover
   d. Retailer Turnover
   e. Producer Profit
   f. Retailer Profit
   g. Refill Schemes
   h. Consumer's Washing
   i. Recycling
   j. Mixed Waste Treatment
   k. Litter Clean-up
   l. Business Administration
   m. Waste-Water Treatment Costs
4. Employment:
   a. Manufacturing
   b. Refill Schemes

c. Recycling
d. Mixed Waste Treatment
e. Litter Clean-Up

2 FISHING GEAR

The analysis (see annex 7) follows a stepwise approach

- Estimation of the amount of fishing gear used annually
- Estimation of the current level of waste both through lost fishing gear and through port waste management
- An estimation of the effectiveness of the different policy options
- Costs related to handling, recycling and landfilling along with a fixed cost for the scheme in question

The quantified costs are supplemented by a qualitative and distributional analysis.

ANNEX 5: REGULATORY FRAMEWORK

Marine litter has been recognised as a problem, which led over the years to the development of a policy framework ranging from water and marine policy, to waste and product policy to measures under the Common Fisheries Policy. Parts of this framework have focused on the different pathways and aiming to reduce entry in the sea from waste or sewage systems or from sea based sources. The main horizontal piece of legislation is the Marine Strategy Framework Directive, which has the most explicit focus on marine litter and reducing its impacts. However, it does not link well to efforts to reduce specific items (rather leaving the scope and ambition of measures up to Member States). Agenda 2030 adopted by the United Nations General Assembly in September 2015 includes the target "*By 2025 prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.*"[1] The indicative target to reduce marine litter by 30% was adopted by the Commission in 2014, as part of the Circular Economy package and endorsed by the Council. This target emphasised the need to galvanise action, but again did not properly link to specific measures.

Overall, the policy framework is wide – reflecting the wide range of sources, means of release and pathways – but there is a gap at present between the problems identified, their drivers and the objectives and measures that can effectively target specifically the sources of marine litter.

1 WATER AND MARINE POLICY

Directive 2008/56/EC (the Marine Strategy Framework Directive "MSFD") is the only EU legal instrument tackling marine litter explicitly and directly. It does not regulate specific human activities but is to ensure good environmental status of the marine environment. It cannot therefore ensure reduction of litter on beaches and at sea on its own, but it provides a valuable contribution through assessment and monitoring as well as through measures against marine litter.

The MSFD requires Member States to achieve Good Environmental Status (GES) by 2020 for all eleven MSFD descriptors. One of these descriptors (descriptor 10) focuses on marine litter, stating that GES is achieved only when "properties and quantities of marine litter do not cause harm to the coastal and marine environment". Member States provided in 2012 their assessment and determined GES and targets for marine litter, while in 2014 they reported on their monitoring activities.

The Member State measures confirm that litter is an 'emerging' pressure on the marine environment, receiving widespread attention. The Directive has led to an improved understanding of macro- and micro-litter, notably from plastics. Sources of marine litter have been mostly attributed to the following human activities: tourism and recreational activities, urban waste, industrial activities, shipping, and commercial fishing.

There are positive aspects related to monitoring (appropriate coverage and frequency of monitoring litter on the beach, satisfactory degree of consistency in monitoring programmes in most marine regions, links to international and regional standards), but also areas that need urgent improvement. For instance, litter monitoring in the seabed and water surface and monitoring of micro-litter is far from adequate. There is no systematic and comparable

[1] Transforming our world: the 2030 agenda for sustainable development; sustainabledevelopment.un.org; A/RES/70/1

monitoring of the impact of litter on marine animals and nature; localisation and extent of human activities generating marine litter are often not covered by the monitoring programmes in place. Also, there are no agreed baselines or thresholds for litter and micro-litter, which makes the monitoring of progress towards good environmental status difficult. This will also affect the EU's ability to meet internal (7th Environment Action Programme to 2020, Circular Economy action plan) and international commitments (see below and Annex 5).

Member States had to submit by March 2016 Programmes of Measures for reaching Good Environmental Status (GES) by 2020.

A preliminary analysis shows that the Programme of Measures (PoMs) submitted by the 23 Coastal Member States[2] focused on a variety of general actions including fishing for litter initiatives, beach cleaning activities and awareness raising, improvement of port reception facilities, extended producer responsibility, deposit schemes, and more. Most Member States also proposed a number of specific measures targeting ALDFG, highlighting the importance of the issue in national decision-making. Many countries aim to improve the collection of lost and abandoned fishing gear. For example, in Croatia fishers need to collect marine waste that is collected in their nets, store it in the prepared sacks and place it in PRFs. Countries also target the prohibition of certain equipment, as well as the redesigning of products to prevent ghost fishing (i.e. increasing selectivity of fishing gear in Bulgaria). Under the MSFD, countries like Spain, Malta and Belgium are exploring the creation of a market for plastic waste from fishing gear, while Estonia and Poland target regulation on marking, tagging and electronic reporting systems. Besides awareness raising campaigns for the wider population, Ireland, France, Malta and Spain are developing specific trainings and education programmes aiming to sensitize fishers and seafarers to the issue of marine litter and the key role they could have in solving the challenge.

Member States draw on the existing EU legislation, as well as on international agreements and regional action plans to fight marine litter[3]. The Commission supports technically and financially the implementation of such plans developed under the Regional Seas Conventions and encourages Member States to use them for more efficient coordination of their national efforts to fight marine litter. The submitted measures on marine litter included beach cleaning and awareness raising campaigns; while these have a modest direct impact on reducing the pressure, they also raise awareness. Targeted measures for beach litter, such as by limiting the wide consumption of single-use plastics, or for the reduction of microplastics and of litter from aquaculture were however underdeveloped. Most Member States consider that they cannot estimate when good environmental status for litter will be achieved.

Overall, it seems difficult to reach the 30% marine litter reduction indicative target set in the Circular Economy Package or evaluate progress towards its achievement without additional measures.

In April 2017, a revised Commission Decision was adopted: Good Environmental Status (GES) should be determined on the basis of amounts, while threshold values will have to be established at Union or other levels (regional/sub-regional) for litter and microlitter on beaches/water column/seafloor, for litter ingested by marine animals and for adverse effects (entanglement, other types of injury or mortality or health effects, of the species concerned due to litter). Setting thresholds for litter quantities and impacts at the appropriate geographic

[2] The analysis of PoMs did not cover Slovenia.

[3] Regional action plans exist for the North-east Atlantic, Baltic and Mediterranean regions, while the one for the Black Sea is being developed.

level will also enable the setting of targets and monitoring of progress towards their achievement. Moreover, it will allow for better evaluation of the effectiveness of measures.

EU funding is also being deployed to understand and combat the rise of marine litter[4], supporting global, national and regional action — for example, in November 2017, the Commission launched a call for proposals for €2 million to tackle the problem of marine litter[5].

Directive 2006/7/EC concerning the management of bathing water quality requires visual checks for pollution such as plastic, rubber or any other waste. When such pollution is found, adequate management measures need to be taken**.** For Blue Flag beaches, there are also requirements on managing litter.

Directive 91/271/EEC concerning urban waste-water treatment (UWWTD) has the objective to protect the environment from the adverse effects of urban waste-water discharges and discharges from certain industrial sectors and concerns the collection, treatment and discharge of waste-waters. Whilst the UWWTD has improved the quality of discharges over the years, there are still cases of plastic and other litter entering the environment through the sewage network, for example, through Continuous Storm Overflows (CSOs). Micro plastics are either not completely captured in the treatment plants or accumulate in the sludge – part of it being reused in agriculture with a clear risk of releases of micro plastics back to the environment. The Commission is evaluating the UWWTD, and this is an issue that will be considered[6].

Through its legislative proposal for a review of the **Drinking Water Directive**[7] the Commission is promoting access to tap water for EU citizens, therefore reducing packaging needs for bottled water (bottles are a frequently found item, but it is often difficult to tell what was in the bottle). At the same time, the proposal includes the obligation to monitor the presence of micro plastics in the drinking water when there is a risk and to take remedial actions in case of potential danger for human health

The **Water Framework Directive** requires Member States to adopt programmes of measures to achieve good environmental status of the water bodies. This legislation does not oblige Member States to take measures against litter in surface waters, but if they do, they should report those measures.

The Fertilizers Regulation concerns the issue of contaminating the soil and, from there, freshwater rivers/basins through the wash-out of remnants from plastic items used in agriculture (the so-called "other polymers than nutrient polymers").

[4] For instance, in the Arctic Region, the Circular Ocean INTERREG project is testing new opportunities for reusing old fishing nets, including a material to remove pollutants from water (http://www.circularocean.eu/). In the Baltic Sea Region, the BLASTIC project maps potential litter sources in urban areas and monitors litter levels in the aquatic environment (https://www.blastic.eu/). Both projects are supported by the European Regional Development Fund.

[5] Under the overarching 'Sustainable Blue Economy' call: https://ec.europa.eu/easme/en/information-day-blue-growth-calls-under-emff.

[6] https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-4989291_en

[7] COM(2017) 753 final

2 WASTE AND PRODUCT POLICY

Directive 2008/98/EC (the Waste Framework Directive) requires that waste be managed without endangering human health and harming the environment, and in particular without risk to water, air, soil, plants or animals. It sets the basic concepts and definitions related to waste management and contains broad objectives on prevention and waste management. It establishes the "waste hierarchy as the framework for waste management with waste prevention (ie: reduced generation of waste) as the preferred option. The Directive introduces and implements the principles of "polluter pays" and the "extended producer responsibility (EPR)". The Directive requires that Member States adopt waste management plans and waste prevention programmes.

The revision of the Waste Framework Directive[8] (agreed and awaiting adoption by the co-legislators in summer 2018) will provide for additional measures that will contribute to the prevention of litter. These measures consist of: (1) increase of the recycling targets for municipal waste including for plastic packaging; (2) new rules on extended producer responsibility schemes that will require fees paid by the producers to be linked with the "re-usability" and "recyclability" of the products ("modulated fees") and that will allow producers to be charged for prevention measures, such as prevention campaigns, and the clean-up of litter; (3) measures aiming to halt the generation of marine litter as a contribution to UN Sustainable Development Goal 14 to prevent and significantly reduce marine pollution of all kinds; (4) measures to prevent and reduce litter from products that are the main sources of littering notably in the natural and marine environments; and (5) information campaigns to raise awareness about waste prevention and littering; (6) the requirement on the Member States to revise their waste prevention programmes to reflect the objectives on the prevention of (marine) litter and their waste management plans to provide for measures to combat and prevent all forms of littering and to clean up all types of litter. Member States will also be required to coordinate their different plans and measures on litter that are required under international and EU water legislation that envisage specific action to tackle litter in the aquatic environment (Regional Seas Conventions, Directive 2008/56/EC and Directive 2000/60/EC) and waste legislation that tackles land based litter.

Where single use items would qualify as packaging, **Directive 94/62/EC on packaging and packaging waste** sets targets for the recovery and recycling of packaging waste and essential requirements for placing packaging on the market. The revision of the Packaging and

[8] COM(2015)595 final.

Packaging waste Directive[9] (that should be adopted by the co-legislators in summer 2018) envisages new rules: a new target of 55% recycling of plastic packaging waste by 2030, ban on landfilling of separately collected waste and introduce EPR obligation and establish minimum requirements for EPR schemes. In practice, in order for Member States to achieve these targets they would need to improve separate collection, sorting and recycling. The area and methods to improve separate collection are, in line with the construct of the EU waste Directives and the principle of subsidiarity, decided upon by the Member States. Some SUP are considered as packaging if they contain a product (e.g. cups filled with a beverage at the point of sale): drinks bottles, caps and lids; crisp packets and sweet wrappers; plastic bags; food containers including fast food; cups. However, the same SUPs may also fall outside the definition of packaging if it is being sold separately (e.g. a pack of empty cups that can be used for filling by the consumers themselves). As a result, the same product is subject to different legal acts and measures.

The **Plastic Bags Directive (EU) 2015/720** amended Directive 94/62/EC on packaging and packaging waste to promote reduction of the consumption level of lightweight plastic carrier bags. Member States can choose which measures to put in place to achieve a consumption rate of below 40 bags per person per year by 2025, including the use of economic instruments such as pricing, taxes and levies and marketing restrictions such as bans that are proportionate and non-discriminatory, and national reduction targets.

The EU **Plastics Strategy** includes a series of actions to transform the way products are designed, produced, used, reused and recycled in the EU. Under the new plans, all plastic packaging on the EU market should be recyclable by 2030, and the intentional use of microplastics in products should be restricted through REACH. The European Chemicals Agency is indeed preparing a restriction dossier concerning **microplastic particles intentionally added to preparations, such as cosmetics, detergents, paints** for both professional and consumer use. ECHA is also preparing a restriction dossier regarding the use of oxo-degradable plastics, which are designed to degrade into particles and have uses as agricultural films, rubbish bags and other packaging.

New efforts will increase the profitability of recycling for business. There is support for innovation with an additional €100 million financing for developing smarter and more recyclable plastics materials, for developing renewable feedstock for plastics, for improving bio-degradation processes, for making recycling processes more efficient, tracing and removing hazardous substances and contaminants from recycled plastics.

The strategy also commits the Commission to the establishment of a clear regulatory framework for plastics with biodegradable properties. Biodegradable and compostable plastics are developed in response to the high level of plastic leakage into our environment. Targeted applications, such as using compostable plastic bags to collect organic waste separately, have shown positive results; and biodegradability standards exist (for plastic mulches[10]) or are being developed for other specific applications. However, most currently available plastics labelled as biodegradable generally degrade under specific conditions only, which may not always be easy to find in the natural environment, and can thus still cause harm to ecosystems. Biodegradation in the marine environment is particularly challenging. It is important to ensure that consumers are provided with clear and correct information, and to make sure that biodegradable plastics are not put forward as a solution to littering.

[9] COM(2015)596 final

[10] CEN standard EN 17033 for ‚Plastics – Biodegradable mulch films for use in agriculture and horticulture – Requirements and text methods‘

The **General Product Safety Directive** (GPSD) 2001/95/EC ensures that only safe products are made available on the market. The GPSD applies in the absence of other EU legislation, national standards, Commission recommendations or codes of practice relating to safety of products. The GPSD establishes obligations to both businesses and Member States' authorities. Businesses should place only products which are safe on the market, inform consumers of any risks associated with the products they supply. They also have to make sure any dangerous products present on the market can be traced so they can be removed to avoid any risks to consumers.

Food Contact Material through Commission Regulation (EC) No 282/2008 on recycled plastic materials and articles intended to come into contact with foods.

The set of criteria for products and services under the EU **Ecolabel and Green Public Procurement** promote reusable and/or recyclable items and packaging.[11]

3 FISHING GEAR AND SHIPPING

Fisheries Control Regulation[12] (EC) No 1224/2009 of November 2009 establishes a Community control system for ensuring compliance with the rules of the common fisheries policy. It addresses ALDFG in so far as it requires the mandatory marking of gear as well as the retrieval of gear in the event of loss and the notification of the loss in case retrieval is not possible.

The provisions on the marking of fishing gear (Article 8 of Fisheries Control Regulation and implementation rules Articles 8 to 17 of Commission Implementing Regulation (EU) No 404/11[13]) apply to EU vessels when fishing with passive gears and beam trawls in EU waters, and to fishing aggregating devices (FADs). They are in line with the international codification system of the International Maritime Organisation (IMO) and the International Convention for the Prevention of Pollution from Ships (MARPOL), and the related provisions adopted in international fora (RFMOs). Article 48 of Fisheries Control Regulation requires fishing vessels to have on board equipment to retrieve lost gear. It also requires the master of the fishing vessel that lost gear or part of gear to attempt to retrieve it as soon as possible. If the lost gear cannot be retrieved, the master shall inform the competent authority of its flag state, which shall then inform the competent authority of the coastal state, within 24 hours of the following:

- The external identification number and the name of the fishing vessel;
- The type of lost gear;
- The time when the gear was lost;
- The position where the gear was lost, and
- The measures undertaken to retrieve the gear.

An analysis conducted as part of the evaluation of the Control Regulation found that one Member State, Portugal, recorded an average of 100 incidents per year between 2010 and 2014 whereas the others reported 8 between them. Authorities from Bulgaria, Germany,

[11] Examples include the Ecolabel criteria for tourism and the Green Public Procurement criteria for food and catering restrict the use of single-use plastics in catering.
[12] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:343:0001:0050:EN:PDF
[13] Commission Implementing Regulation (EU) No 404/2011 of 8 April 2011 laying down detailed rules for the implementation of Council Regulation (EC) No 1224/2009 establishing a Community control system for ensuring compliance with the rules of the Common Fisheries Policy (OJ, L 112, 30.04.2011, p 1)

Denmark, Finland, France, Ireland, Lithuania, Malta, Poland, Romania, Sweden and the United Kingdom reported no incidents over the five years.

Regarding gears retrieved by competent authorities but not reported as lost, the competent authorities may recover the cost from the master of the fishing vessel that lost the gear.

Under Article 48(.5) of Fisheries Control Regulation, a Member State may exempt vessels of less than 12 metres length overall flying its flag from having on board recovery equipment, if they operate exclusively within the territorial sea of the MS and never spend more than 24 hours at sea from the time of departure to the return to port.

The above provisions will be reinforced. in the 2018 Commission is preparing a proposal to for amendment of the Fisheries Control System, which will by introduce information on lost gears into the electronic reporting obligations by masters of fishing vessels.

Furthermore, the structural support tool for the Common Fisheries Policy, the **European Maritime and Fisheries Fund (EMFF)**, may provide financial support for the recovery of litter and gear from the sea. Such support can come for action that is either part of fishing activities,(i.e. bringing litter that is caught in the nets while fishing back ashore - so called "passive" fishing for litter), or as part of specific retrieval and recovery actions of waste and/or lost and abandoned gear ("active" fishing for litter). Over the seven year period 2014-2020, 14 Member States plan a total of 108 such projects supported with around €22 million from the EMFF. In the proposal for the revision of the EU Fisheries Control System the European Commission will introduce amendments to the reporting measures for operators which lose fishing gear in order to identify areas of concentration of lost fishing gear and to facilitate its retrieval. The information reported to the Commission as part of the monitoring of implementation is limited to the number of operations and the planned EU and national contributions. Authorities are not obliged to collect or report information on the operations such as direct results or impacts.

The improvement of waste handling infrastructure and management processes on vessels and at ports is also eligible for support under the EMFF. As are other measures to reduce the impact of fishing on ecosystem such as innovation in catch handling, storing, processing and marketing processes[14].

In addition to the EMFF, other EU funding programmes (Horizon 2020, Life, ERDF etc.) also finance actions for the prevention, reduction and retrieval of marine litter via actions under shared management with Member States.

The Commission also directly finances action to understand and combat the rise of marine litter,[15] via the EMFF, for example, via a call for proposals for €2 million launched in November 2017[16]. The received proposals are currently being evaluated.

Illegal fishing activities may contribute to ALDFG, however, the **IUU Regulation**[17] does not include any specific provisions on accidental loss, deliberate abandonment or reporting and retrieval of gear. These actions are not covered by the definition of IUU fishing activities.

[14] EMFF, Articles 38.1c, 39, 40.1a and 43.1

[15] For instance, in the Arctic Region, the Circular Ocean INTERREG project is testing new opportunities for reusing old fishing nets, including a material to remove pollutants from water (http://www.circularocean.eu/). In the Baltic Sea Region, the BLASTIC project maps potential litter sources in urban areas and monitors litter levels in the aquatic environment (https://www.blastic.eu/). Both projects are supported by the European Regional Development Fund.

[16] Under the overarching 'Sustainable Blue Economy' call: https://ec.europa.eu/easme/en/information-day-blue-growth-calls-under-emff.

Within the CFP, a number of sea basic specific regulations contribute to the sustainable management of fisheries resources and in particular the selectivity of the fishing gear. The provisions in these regulations do not target potential loss or abandonment of fishing gear or releases of material into the marine environment or their potential environmental impacts in terms of marine pollution or ghost fishing.

The proposal to merge and update the various existing **technical regulations** into a single legal text that is currently under discussion by the co-legislator[18] does not foresee the introduction of these issues.

Directive 2000/59/EC on port reception facilities for ship generated waste and cargo residues ("PRF Directive")

The Directive aims to reduce all discharges of waste from ships at sea, including from fishing vessels and recreational craft. To this end, it requires MS to provide for adequate port reception facilities, and ships to deliver their waste to these facilities before departure from the port. It also requires MS to set up cost recovery systems, which must provide no incentive for ships to discharge their waste at sea; this is achieved by requiring part of the fee charged to ships to be an indirect fee, i.e. to be paid irrespective of delivery. The current Directive also requires 25% minimum target for inspections of the mandatory delivery requirement, as well as the development of waste reception and handling plans for ports and advance waste notification from ships.

In 2018, the European Commission adopted a proposal for a new PRF Directive (as part of the Commission's Circular Economy Package), seeking further alignment with the MARPOL Convention with a special focus on addressing marine litter from sea-based sources. Through a mix of incentive and enforcement measures, the proposed Directive should result in maximising garbage delivery from ships to waste reception facilities in ports. The charges for bringing litter ashore, including fished-up litter, will be independent of the amount. Reporting and inspection obligations for fishing vessels and small recreational craft have been brought more in line with other vessels. The proposal will improve the adequacy of port reception facilities, in particular their operation in accordance with EU waste legislation, including the obligation for separate collection of waste from ships. Voluntary and national measuresVoluntary and national measures

In the context of an ongoing pledging call there are already a number of voluntary initiatives by industry that complement and help deliver on policy objectives, such as:,

- Several supermarkets have committed to having no packaging for their own brands in the near future, or to organize the collection of plastic bottles by refunding the consumers bringing back their plastic wastes, or to substitute plastic packaging by other materials;
- The fishing industry has committed to a number of marine litter collection initiatives, either voluntarily or with EMFF support[19]. Business initiatives like e.g. ECOALF (https://ecoalf.com/es/) combine recycling plastics and marine litter with high added value design and manufacturing of apparel and clothing in Europe. Examples also exist for aquaculture where e.g. shellfish producers clean up their production areas.
- In Iceland, a fisheries association organises the sale of end-of-life gear to recycling company and claims that they achieve a recycling rate of 90%.

[17] Council Regulation (EC) No 1005/2008
[18] COM(2016) 134
[19] Fame report on EFF and EMFF supported projects

- Major plastic resins producers have committed to reduce significantly pellets losses occurring during the transport or handling of resin pellets ("Operation Clean Sweep").
- The cosmetics industry has committed to eliminate the use of microbeads in rinse-off products and is today reaching a level of 82% of substitution.
- Around 1,400 voluntary commitments were registered and announced at The Ocean Conference for implementation of Sustainable Development Goal 14 (SDG 14) in 2017. To facilitate collaboration and networking amongst different actors in support of SDG 14, the United Nations has launched nine thematic multi-stakeholder Communities of Ocean Action.
- At the Our Ocean conference in Malta 103 commitments (worth almost EUR 3 billion) out of a total of 437 (worth EUR 7.2 billion) targeted marine pollution and plastics, focussing on prevention and innovation. Commitments were from 29 states, with around 10% from the private sector some of which pledging 100% recyclability of packaging (including Werner & Mertz, Unilever, M&S, PepsiCo, The Coca-Cola Company,).

With regard to measures at national or local level the choice of measures is left to Member States administrations - in line with the **principle of subsidiarity**. There is a wide range of measures available and effectively piloted and proven but applied in a relatively uncoordinated way. For example, a number of Member States have refundable deposit schemes for bottles. Targeted deposit schemes can help reduce littering and boost recycling, and have already helped several countries achieve high collection rates for beverage containers.[20] In Germany 98 per cent of cans and plastic bottles are recycled; the Netherlands 95 per cent; whereas countries with no deposit scheme usually only recycle around half.

Similarly, Italy will ban non-biodegradable cotton bud sticks (ban to come into force from 1/1/2019) and microplastics in cosmetics ("cosmetici da risciacquo ad azione esfoliante o detergente contenenti microplastiche", from 2020). France has notified the Commission of its intention to ban plastics-made cotton bud sticks from 2020, and Scotland is consulting on this issue with an intention to introduce a ban.

4 INTERNATIONAL POLICY CONTEXT

The EU is a Contracting party to the Barcelona, OSPAR and HELCOM Conventions for the protection of the marine environment in the Mediterranean, the Northeast Atlantic and the Baltic respectively. The Commission, representing the EU in these Conventions has supported the adoption and implementation of action plans to combat marine litter in these marine regions. The Commission also supports financially and technically the development of such an action plan in the fourth European marine region, the Black Sea[21]. Regular meetings take place for the coordination of the regional activities against marine litter among themselves, and with the implementation of MSFD at EU and national level.

In 2015, UN member countries adopted the **2030 Agenda for Sustainable Development,** which includes 17 Sustainable Development Goals (SDGs)[22]. The EU and its Member States

[20] The five best performing Member States with deposit schemes for PET bottles (Germany, Denmark, Finland, the Netherlands and Estonia) reached an average collection rate for PET of 94% in 2014.

[21] Action Plan for the Mediterranean: http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/decision_21_7_marine_litter_mediteranien.pdf
Action Plan for the Atlantic: http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/atlantic_mlrap_brochure.pdf
Action Plan for the Baltic : http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/baltic_regional_action_plan_marine_litter.pdf

[22] https://sustainabledevelopment.un.org/post2015/transformingourworld

are committed to the 2030 Agenda and to driving forward its implementation[23]. Several of the Sustainable Development Goals and associated targets are of particular relevance to marine litter. Meeting the objectives of the 2030 Agenda and its SDGs will require commitment at local, regional and global levels, including though partnerships with relevant stakeholders. The EU can play an important role in fostering such co-operation.

The **United Nations Environment Assembly** (UNEA) has consistently highlighted marine plastic debris and micro-plastics amongst the issues of global importance. At the second UNEA session (UNEA-2) in 2016, resolution UNEP/EA.2/Res.11 on marine plastic litter and micro-plastics was adopted. In this resolution, governments requested an assessment by the United Nations Environment Programme (UNEP) of the effectiveness of relevant international, regional and sub-regional governance strategies and approaches to combat marine plastic litter and micro-plastics, taking into consideration the relevant international, regional and sub-regional regulatory frameworks. The resolution called for identification of possible gaps as well as options for addressing these gaps. The session of the United Nations Environment Assembly held in Nairobi on 4-6 December 2017 (UNEA-3), addressed the theme 'Towards a pollution-free planet'. UNEA-3 adopted a resolution on marine litter micro-plastics building on the above-mentioned UNEP assessment[24]. The resolution established an Ad Hoc Open Ended Expert Group to further examine the barriers to, and options for, combating marine plastic litter and micro-plastics from all sources, especially land based sources.

Moreover, UNEP has launched initiatives to address specifically the impacts of plastic waste entering the sea from land. The **Global Programme of Action for the Protection of the Marine Environment from Land-based Activities** (GPA), the **Global Partnership on Marine Litter** (GPML)[25], and **Clean Seas**, a global campaign to eliminate major sources of marine litter: microplastics in cosmetics and the excessive, wasteful usage of single-use plastic by the year 2022. Under Clean Seas, governments are urged to pass plastic reduction policies; targeting industry to minimize plastic packaging and redesign products; and calling on consumers to change their throwaway habits[26].

Concerning plastic waste and other types of waste discarded from ships, **the International Maritime Organisation** (IMO) has developed action to address the issue, in particular by further regulating the discharges of garbage from ships in the context of the MARPOL Convention[27]. Annex V to MARPOL prohibits the discharge of all types of garbage into the sea from ships, except in the cases explicitly permitted under the Annex (such as food waste, cargo residues, cleaning agents/additives that are not harmful to the marine environment). Garbage from ships includes all kinds of food, domestic and operational waste, and comprises all plastics as well as fishing gear. Annex V applies to all types of ships operating in the marine environment, including fishing vessels and recreational craft.

---

[23] Council conclusions 'A sustainable European future: The EU response to the 2030 Agenda for Sustainable Development' (General Affairs Council, 20 June 2017); 'Next steps for a sustainable European future – European action for sustainability' (COM(2016) 739)

[24] UNEP (2017), Combating marine plastic litter and micro-plastics: An assessment of the effectiveness of relevant international, regional and subregional governance strategies and approaches

[25] https://www.unep.org/gpa/what-we-do/global-partnership-marine-litter

[26] Ten countries have joined the campaign with far-reaching pledges eg Indonesia has committed to slash its marine litter by 70 per cent by 2025; Uruguay will tax single-use plastic bags and Costa Rica will take measures to dramatically reduce single-use plastic through better waste management and education

[27] http://www.imo.org/en/about/conventions/listofconventions/pages/international-convention-for-the-prevention-of-pollution-from-ships-(marpol).aspx

Under the **Basel Convention**[28], Parties have adopted a number of measures including an Environmentally Sound Management (ESM) toolkit that they can use in shaping their national policies to ensure a sound management of waste, so contributing to achieving the SDGs. The ESM toolkit consists of practical manuals on waste management and fact sheets covering specific waste streams; and guidance for developing efficient strategies on waste prevention[29]. It includes incentives to encourage private sector investments, training materials, checklist for self-assessment of national capacity, pilot projects, ESM criteria and case studies on the promotion of ESM in the informal sector.

Parties under the **Convention on Biological Diversity** have adopted decision XIII/10 to prevent and mitigate the potential adverse impacts of marine debris on marine and coastal biodiversity and habitats[30]. The decision invites Parties and other governments to consider extended producer responsibility for providing response measures where there is damage or sufficient likelihood of damage to marine and coastal biodiversity and habitats from marine debris.

Both the G7 the G20 have addressed the issues of resource efficiency and marine litter. The **G7 Action Plan to Combat Marine Litter**[31] commits G7 members to priority actions and solutions to combat marine litter and stresses the need to address land- and sea-based sources, removal actions, as well as education, research and outreach. A similar approach has recently been adopted by the G20 through the **G20 Action Plan on Marine Litter**[32], where the G20 recognised the urgent need for action to prevent and reduce marine litter in order to preserve human health and marine and coastal ecosystems, and mitigate marine litter's economic costs and impacts.

In February 2018, the FAO Technical Consultation adopted the Report and the **Voluntary Guidelines on the Marking of Fishing Gear** by consensus that are expected to be endorsed at the next COFI meeting in July 2018. The Guidelines include indications to implement a gear marking system; to control and enforce it; to report on and encourage recovery of ALDFG; to improve commercial traceability of fishing gear marking; to encourage research, awareness raising and capacity development; and guidance on the special requirements of developing States and small scale fisheries. An Annex on a Risk Based Approach to assist relevant authorities in determining the appropriateness or otherwise of implementing a system for marking fishing gear is part of the guidelines. It is expected that FAO will be requested to develop a comprehensive global strategy to address ALDFG and to encourage States to develop ALDFG action plans.

The EU is a Member to 16 **Regional Fisheries Management Organisations (RFMOs**) who are in charge of the long-term conservation and management of world fish stocks, as well of the adoption of technical measures regulating each fishery. The discard of plastic residues at sea is already forbidden by the International Convention for the Prevention of Pollution from Ships (MARPOL) which also includes fishing vessels. However, MARPOL does not cover all Regional Fisheries Management Organisations (RFMOs) nor the prohibition to dispose plastics at sea is established and monitored by all RFMOs.The European Commission promotes the revision or update of the relevant provisions of the Regional Fisheries

[28] Basel Convention on the Control of Transboundary movements of Hazardous Wastes and their Disposal.
[29] http://www.basel.int/Implementation/CountryLedInitiative/EnvironmentallySoundManagement/Overview/tabid/3615/Default.aspx
[30] https://www.cbd.int/doc/decisions/cop-13/cop-13-dec-10-en.pdf
[31] https://www.g7germany.de/Content/EN/_Anlagen/G7/2015-06-08-g7-abschluss-eng_en.html
[32] https://www.g20.org/Content/DE/_Anlagen/G7_G20/2017-g20-marine-litter-en.html?nn=2186554

Management Organisations (RFMOs), including extending to all RFMOs the prohibition on the disposal of plastics at sea.

As part of the efforts to step of international ocean governance, bilateral agreements are currently being prepared with seven priority countries, i.e. Canada, USA, China, Japan, Australia, New Zealand, and Indonesia. These **ocean partnerships** seek to improve coordination and cooperation for better ocean management and will cover concerted actions on marine litter.

National measures are also being put in place worldwide. For example, Taiwan as part of its "Sea Waste Management Platform" has an ambitious 12-year timeline Tuesday to eliminate four types of single-use plastics—takeaway beverage cups, drinking straws, shopping bags and disposable tableware. For example, in 2020, free plastic straws will be banned from all food and beverage establishments; from 2025, plastic straws for carryout will be banned and customers will need to pay a fee to use them; in 2030, a ban on the use of plastic straws at all establishments in Taiwan.

5 CHANGES IN REGULATORY POLICY UNDER THE BASELINE OPTION 1

Option 1 covers the current regulatory framework that includes measures and policies at EU level that have been recently adopted or proposed by the Commission. Section 5.2.1 describes the changes under the baseline succinctly, and here they are set out in more detail.

This option entails an increased focus in the existing legislation on items already covered today in separate collection schemes (e.g. packaging such as beverage bottles, bags) and on fishing gear. It also includes the general expected changes in consumption for single use plastics items.

The measures included in this option include:

- Measures on waste management, including measures those of the recently revised Waste Framework Directive and Packaging and Packaging Waste Directive (that will enter into force in 2020, when Member States will have to transpose these amendments):
    - The Packaging Directive, as amended, will re-focus the prevention objectives on re-use of packaging, however, the substantial obligation will merely require Member States to "encourage" the reuse of packaging. More ambitious and concrete measures in the Packaging Directive are envisaged only with regard to one SUP item - plastic bags. Due to the general ambition of the obligations and the flexibility for Member States to choose the measures, the impact of these measures is difficult to envisage for other SUP items. The fit for purpose of the essential requirements for packaging for purpose to facilitate separate collection and recyclability in view of the circular economy objectives is already challenged in the EU Plastics Strategy and their review is envisaged in 2020.
    - The Packaging Directive, as amended, will establish higher recycling targets – 50% by 2025 and 55% by 2030 for plastic packaging.[33] These would require Member States to improve their separate collection in terms of both capture and quality of the collected material and divert that waste from landfill and incineration to recycling. However, the attainment of this goal would largely depend not on the provision of infrastructure and services because these already cover the Member States territories but on some improvements in those systems

[33] Not to be confused with the reduction targets proposed in this Impact assessment for certain items.

and the effective participation of citizens in separate collection. There are no straightforward solutions to improve that significantly in a short time period and it usually requires a complex set of "carrot and stick" regulatory measures and economic incentives. Also, increase in recycling rates could be achieved without in depth efforts to reduce littering or extending or improving separate collection close to water bodies where the waste loads have large seasonal variations.

- Extension of extended producer responsibility schemes (EPR schemes) to all packaging by 2025. This is unlikely to lead to reduced marine litter as EPR schemes are established in most Member States for household packaging that represents half of the top 10 SUP items. The amendments to the Waste Framework Directive will set minimum requirements for EPR schemes that will contain requirements to facilitate the recyclability of products through the modulation of producers' fees. The new minimum requirements for EPR schemes will make it more explicit that Member States can require EPR schemes to contribute to waste prevention, including through prevention campaigns or clean-up of litter. However, this is not part of a minimum requirement for cost coverage and is therefore likely to remain a measure outside the scope of EPR apart from the couple of Member States that have already taken some small steps in this direction. It is not possible to calculate exactly by how much the quantities of marine litter will be reduced as a result of these measures, because these provisions have a much longer transposition deadline, namely 2023, and event by that date it would still be too early to see the impact of those measures. Also, improved recyclability of products does not necessarily lead to more performant separate collection or phase-out of some SUP for which good alternatives exist in other materials or as re-usable products. With regard to prevention objectives for EPR schemes, as this is not required but allowed under the minimum requirements, this would depend on the Member States initiative to go beyond the EU minimum requirements. Considering that the minimum requirements for EPR schemes will already increase the producers' financial responsibility for the waste management it is likely that further extension of that responsibility would not be an easy policy objective for the Member States to agree on with the producers and producer organisations.
- New prevention objectives requiring Member States to take measures (a) aiming to halt the generation of marine litter as a contribution to UN SDG 14 to prevent and significantly reduce marine pollution of all kinds; (b) to take appropriate measures to prevent and reduce litter from products that are the main sources of littering notably in the marine environment; and (c) to organise information campaigns to raise awareness about waste prevention and littering. With regard to point (a), while these new provisions require Member States to take measures to tackle marine litter, that obligation is formulated in such a way ("measures that shall aim to") that does not require Member States to actually achieve or demonstrate the attainment of that objective. Similarly, under point (b) the provision introduces significant flexibility to Member States with regard to the products they may choose to target and the measures to do that, including the explicit reference that market restrictions are measure that Member States can consider. As described in section 3.1.2. this may lead to scattered policies and measures that would also have an impact on the fragmentation of the internal market.
- The requirement on the Member States to revise their (a) waste prevention programmes to reflect the objectives on the prevention of (marine) litter and (b) waste management plans to provide for measures to combat and prevent all forms

of littering and to clean up all types of litter (not limited to land based litter). Member States will also be required to coordinate these plans and measures on litter with other plans and measures that they are required to adopt under international and EU water legislation to tackle litter in the aquatic environment[34]. It is not possible to calculate by how much the quantities of marine litter will be reduced exactly as a result of this obligation, in particular, because it is a more procedural requirement with no measurable outcome.

- Marine Strategy Framework Directive (MSFD), Urban waste water treatment Directive and Water Framework Directive:
    - Under the MSFD, Member States had to adopt measures to address marine litter by 2016. However, on the basis of the information contained in the programmes of Measures submitted (in 2016) by the Member States, it is not possible to calculate by how much the quantities of marine litter will be reduced. The Commission's assessment of the measures shows that the most common type of measures reported by Member States include beach clean-ups and 'fishing for litter'. These are costly downstream measures, as opposed to upstream measures to improve waste management and prevention, and that do not prevent the littering at source. Therefore, they have a modest impact on reducing the pressure, but they do raise awareness. However, wide application by Member States of such measures would signal the need for harmonisation at EU level, in particular in view of shifting focus to more effective upstream measures. In fact, targeted measures for beach litter, such as by limiting the proliferation of single-use plastics, or for the reduction of microplastics and of litter from aquaculture were scarcely present in Member States' programmes of measures under the MSFD. Some Member States have taken measures to limit the use of certain plastics in view of its impact on the marine environment, but have not reported them as part of their programme of measures.
    - The Urban waste water treatment Directive provides minimum requirements for the infrastructure for the collection and treatment of urban waste water and quality criteria for the treatment. However, this Directive is not effective concerning the requirements on capture and treatment of storm water overflows and concerning microplastics, which are not covered by the directive. This is in particular an issue for flushable items such as plastic cotton bud sticks and sanitary applications for which the pathway into the sea is through sewage systems. The Water Framework Directive requires Member States to adopt programmes of measures to achieve good ecological status (GES) of the water bodies; however, this legislation does not specifically require action against marine litter or as criteria against which GES should be assessed. However improvements in its implementation should be expected as a result of the new requirement to coordinate these programmes with those under the MSFD and Waste Framework Directive.
- Port Reception Facilities:
    - Introducing a 100% indirect fee for garbage from ships, as well as passively fished waste, and including fishing vessels and recreational craft in the indirect fee regime direct fee based on weight by 100% indirect fee, therefore abolishing disincentive to bring back fished up waste ashore. However, there is no compensation for the inconvenience of sorting and storing the waste on board, some of which will not be from the vessel concerned.

[34] Regional Seas Conventions, Directive 2008/56/EC and Directive 2000/60/EC

    - Requiring port reception facilities to effectively implement the waste hierarchy in the context of management of waste from ships, including separate collection of waste from vessels in port in view of further reuse/recycling. The obligation to collect and subsequently treat waste would fall on the ports and their fees would increase unless compensated by other sources such as the extended producer responsibility scheme adopted for products.
    - Dedicated enforcement regime for fishing vessels over 100 GT (minimum 20% inspection target)
- Fisheries Control Regulation:
    - Full implementation of the current requirements to mark gear (Article 8)35 to carry retrieval equipment on board, to retrieve lost gear or to report its loss in case it cannot be retrieved (Article 48). A planned revision will introduce daily electronic reporting for all vessels and remove the exemption of small vessels from the obligation to carry retrieval equipment.
- European Maritime and Fisheries Fund (EMFF)
    - 2014-2020: 108 operations to support the removal of litter from the sea included in authorities' operational programmes will be fully implemented. Other planned operations targeting marine litter will equally be implemented including those aimed at infrastructure improvements at ports and community led local development, as well as Maritime Policy.
    - Post 2020: It is envisaged, in line with the plastic strategy, to make marine litter a funding priority under the new programming period.
- The FAO voluntary Guidelines on the Marking of Fishing Gear adopted in February 2018 are expected to be endorsed in July 2018 and subsequently implemented.

Finally, the implementation of the actions included in the EU Plastics Strategy and the Communication on the interface between chemical, waste and product legislation are also to be included. In particular, the EU actions listed in Annex I of the Plastics Strategy, as well as the implementation of the options in the Interface communication. This includes new harmonised rules to ensure that by 2030 all plastic packaging placed on the EU market can be reused or recycled in a cost-effective manner. This should also address the challenging segment of 30% of plastic packaging part such as multilayer film and small-format packaging. The Strategy also fosters investment and innovation in the value chain towards circular solutions.

[35] Detailed requirements are included in the Control Implementing Regulation

ANNEX 6: DETAILED ANALYSIS OF MEASURES FOR SINGLE USE PLASTICS

1 Product measure matrix

To determine the range of policy measures to be modelled in the analysis a product-measure matrix was developed. It allows identifying a range of key measures, and the items for which the application of a given measure was deemed relevant. All feasible measures where then modelled for each item to calculate their impact.

In what follows, we start with a description of the key measures selected: these measures were developed throughout the course of the study, including during the development of the Plastics Strategy, and are reflecting also the consultation with industry stakeholders and the wider public. Second, a review of the potential alternative single-use non-plastic (SUNP) and multi-use (MU) items is provided to identify where feasible alternative options exist in the market. Then, a summary of the feasibility, by product and measure, is presented. Finally, the product-measure matrix is displayed to summarise the measures to be modelled for each item.

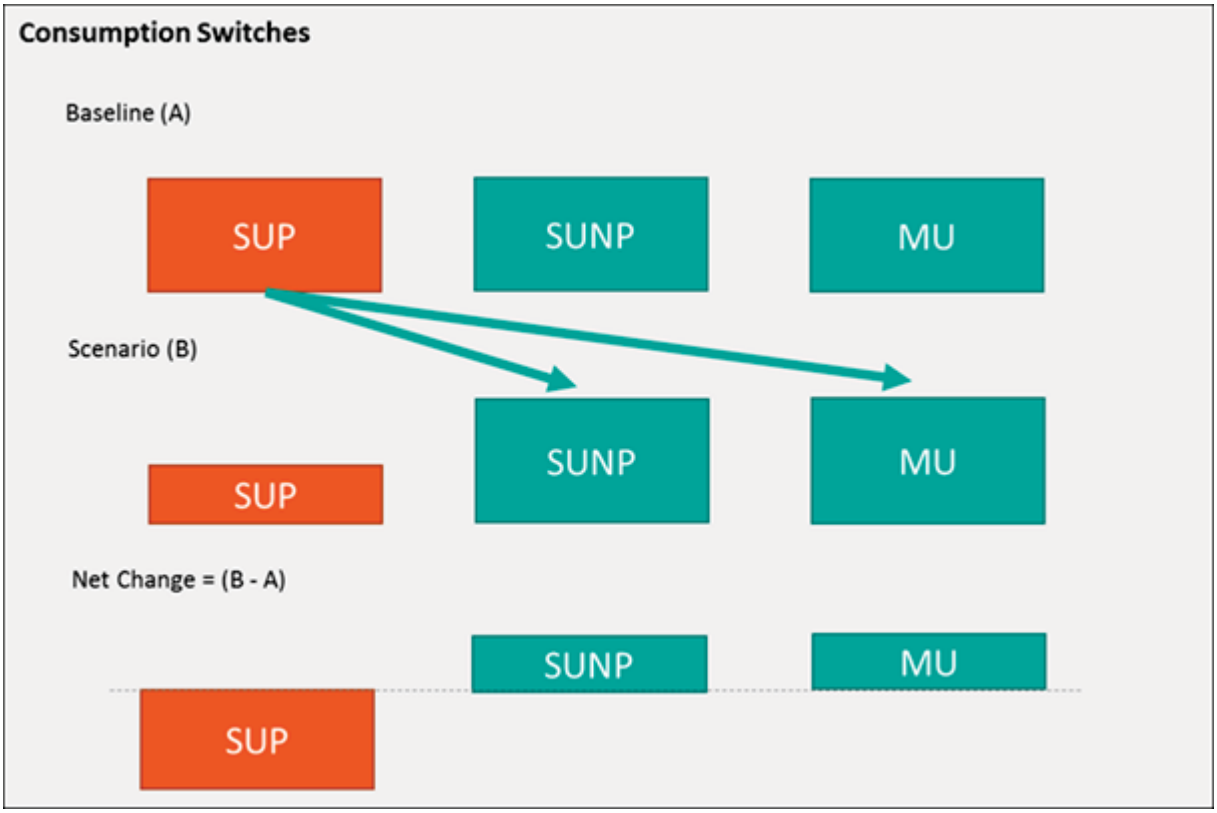
1.1 Link to model

The assessment in this report anticipated the need to evaluate the impact of the deployment of a range of measures used to address the issue of single use plastics (SUPs) being washed onto beaches, and hence, into the ocean. Whilst some measures were expected to affect the rate at which these items might be 'intercepted' before they reached the ocean, others were expected to affect the level of consumption of the SUP items under consideration.

The method used for the analysis was as follows:

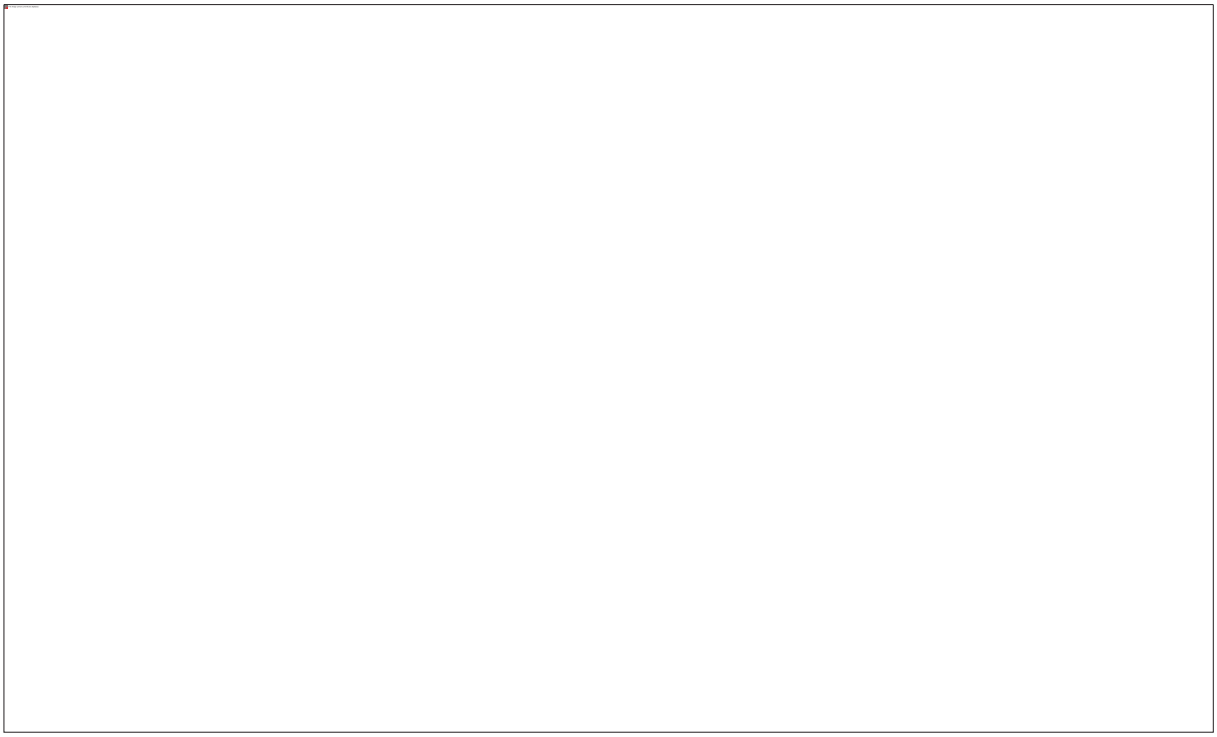
- Analysis was undertaken to identify the top ten SUP items, based on count, in beach litter surveys;
- For each of these, consider the market for the SUP item and its direct substitutes in terms of:
  - The market share for the SUP item itself;
  - The market share for the competing single-use non-plastic (SUNP) items where the term SUNP is effectively shorthand for single use items that are believed to biodegrade in the marine environment, and hence, which are believed to be less problematic if they reach the marine environment (see also below); and
  - The market share for multi-use (MU) (i.e. reusable / refillable) items.
- The way in which the market for a given item is affected by policies already firmly planned, and likely to have an effect in the near future, was modelled. The shift in market shares was considered, as well as the anticipated change in the fate of the different items (see below).
- The policy measures being considered as feasible measures were considered to have an impact on the market for a given items in terms of the shift away from SUPs and into SUNPs and MU items. This is depicted in Table 11.

Figure 1: Schematic of Modelling of Switches in Response to Measures



- The effect of these changes in consumption have a range of different economic and environmental impacts. As the market shares of SUPs, SUNPs and MU items shifts, some producers lose, while others gain. The effect on retailers and the HoReCa sector was also considered, these being linked also to the effects on consumers (which were also identified). In some cases, the measures are also likely to call forward innovation, in terms of substitutes and in terms of the scaling up of business models for MU alternatives. Although this represents a potential opportunity for EU businesses, and one that they may have at global scale (given the rapidly growing awareness of this issue), it was not possible to quantify them in the study (being, as they are, uncertain);
- In terms of the consumption related elements, life-cycle assessment for the SUP, SUNP and MU items was used to model the change in resource use, greenhouse gas emissions and emissions of other pollutants. In addition, the change in the consumption effectively translates into the quantity of material that suffers a given fate (or is managed in a given way). The impacts of these changes were also estimated, including the impacts associated with changes in the quantity of litter.
- Finally, as well as modelling the impact of all feasible measures on each of the items, 4 Options were modelled, which are based on a selection of different measures applied to the different items, each intending to indicate an upward step in the level of ambition in respect of outcomes. Critical, here, was the expected impact on the flow of SUPs into the marine environment.

Figure 2: Material Fates



Research has been undertaken through deployment of a range of methods including: literature reviews of existing research; review of inputs made under the public consultation; one-to-one interviews with a number of stakeholders; workshops involving Commission officials, and external stakeholders; and desk-based research.

In order to develop a bespoke, quantitative model through which to assess the costs and benefits, data from the Joint Research Centre (JRC) were used to confirm the single use plastic (SUP) items that should be taken forward in this study. Selection of these included consideration of the top 10 items, by item count, found littered on beaches, as well as variations by regional sea. In order to develop the model, it was necessary to seek specific data related to the chosen items. To this end, in addition to desk based data gathering, market data reports were purchased, giving the study team significant data on the SUP items identified.

The approach has been to consider the suitability of the different SUPs to be addressed by different types of measures (in a shorter or longer time scale), taking into account the nature of the product, and the ease of substitution by existing alternatives. The elaboration of the measures kept in mind the matters of feasibility of the application of different measures, matters of subsidiarity and any legal issues likely to arise.

Finally, the analysis has considered a range of economic, social and environmental impacts building on the ongoing study. Further work was undertaken to understand better the externalities associated with litter, both when it is first dropped (usually on land, sometimes at sea), and once it has been transported to the beach / sea. In addition, relevant life cycle inventory data for the SUP items, and their most likely single use non-plastic (SUNP) and multiple use (MU) substitutes was examined.

The baseline has been modelled to 2030 – which reflects the date of targets in related legislation. The baseline scenario includes all existing European laws and policies, and those

which are agreed and will come into effect over the period being considered. The implementation of the measures deemed relevant to address each item were each modelled over the same time horizon.

1.2 Description of measures

To determine the range of policy measures to be modelled in the analysis a product-measure matrix was developed to identify a range of key measures and which products could be feasibly covered by them. Firstly, a description of the key measures selected is given – taking into account consultation with industry stakeholders. Secondly, a review of the potential alternative SUNP and MU items is provided to identify where feasible options exist in the market. Thirdly, a summary of the feasibility, by product and measure, is given, and, finally, the product-measure matrix is presented.

The following is a summary description of the individual measures being analysed in the Impact Assessment. It is noted that, despite modulation of fees being raised by stakeholders, this has not been included in the list of measures as modulation of fees according to the potential for an item to be littered or not would be very difficult to determine.

Table 1: Short-listed Measures

Scenario	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, or 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	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 actions, 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, and 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/beach bin infrastructure, d) supporting litter clear up campaigns, e) implementing refill/reuse schemes in the HoReCa 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,

Scenario	Description
	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 Annex 3). Moreover, it could be speculated that smaller items are also littered more frequently as consumers see smaller items as less impactful. Designers could also be required to take into account behavioural insights insofar as these help to minimise the likelihood of SUPs (and other items) being littered. The aim of design measures is to eliminate or reduce the likelihood of items being litter (e.g. by integrating smaller items with larger ones, by changing product interaction, by eliminating need for components/items).
Setting enhanced technical standards for Waste water treatment works (WWTW) and Combined sewer overflows (CSOs)	A range of sanitary items are flushed down drains by consumers, such as cotton buds, wet wipes and sanitary towels. Smaller items may pass through screens at WWTWs or, along with larger items, be flushed out into the rivers and seas through combined sewer overflows during overflow events. This measure implies requiring the implementation of measures believed likely to reduce the flow of SUP items into rivers, and hence, to oceans. In this measure, the costs would fall upon the water utilities and the measures would become integrated within standards under the UWWTD, or similar mechanism (see below for an equivalent measure where the SUP producers pay for the changes). Consultation with private operators in the water industry suggests a range of options which would mitigate flows of these items through this pathway: 1. Control at source; 2. Build bigger sewer systems including with larger overflow tanks; 3. Take surface water out of combined sewers; and 4. Reducing screen size from 6mm to 3mm, and install more screens at CSOs and WWTWs. Point 1 is the focus of the information campaigns indicated above. Points 2 and 3 require expensive civil engineering, although taking these actions would have wider environmental and efficiency benefits, and would have to be implemented over perhaps decades. Point 4 could target specific problem areas in the sewer network, but would still result in significant infrastructure changes.
EPR for flushed items	An EPR scheme for improperly flushed items could be introduced with the intention of a) recovering the costs of some / all of the measures identified in Points 1-4 in the previous measure (described above), and b) influencing the design of what is flushed into the WWTW. In this latter regard, fees could be modulated based upon the likelihood of their continuing to cause problems in the waste water treatment network once the measures have been implemented.
EPR – full cost coverage of litter	Currently there are very few instances where, under extended producer responsibility, producers pay for the costs of clean-up of litter. Two examples can be found in Belgium and the Netherlands.36 Under the principle of extended produced

[36] 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 single 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. In Flanders, it is understood that producers pay €9.6 million annually to fund a national litter prevention programme (€1.50 per inhabitant). Fost Plus (the producer responsibility organization 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

Scenario	Description
collections	responsibility (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. 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.
Specified sales restrictions	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. Other approaches that could be taken include: • Implementing regulations to restrict the sale of any SUP (or any single use) cutlery, straw, stirrer or drinks cup for use on-site i.e. single use 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). • 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	Public authorities have specific competences and influence that can be bought 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: • 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). They may also be able to influence the actions of franchisees.on property which they own.

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. In San Francisco, USA, the municipal authorities have implemented a scheme whereby the manufacturers of cigarettes pay the municipal authorities the relative cost of clean-up of dropped filters. In this case the proportion is 50% by count, and so the companies pay this share of the total cost.

Scenario	Description
DRS	A deposit refund system 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%.37 DRS is not guaranteed to be implemented by Member States to reach the 55% target. 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 DRS 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.
Consumption levies	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 considered in the spirit of a scenario analysis. Charges and levies are only likely to be effective for some items, and not others. For example, 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 improperly flushed items are likely to be more appropriate (these are modelled in the measure above). Cigarettes are also very demand inelastic, and so additional price increases would result in limited changes in demand, if the price differential of alternatives was not significant.
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.
Reduction targets (all SU)	As above.
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.
Ban (of all SU items)	This measure would see complete market bans on the sale of certain SU items by a given year. Bans would have to be regulated to ensure products are not being sold after the date of implementation.

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

1.3 Availability of Alternatives

Cigarette Filters

Plant-derived cellulose filters could be used as an alternative, such as the RAW Biodegradable Slim Filter Tips, although according to anecdotal evidence the draw is not exactly the same as normal plastic based filters. However, there may be room for innovation. Additionally, it has been argued that cigarettes should be sold without filters (such as filterless Gauloise-type cigarettes), as the filters do not have a demonstrable effect on health outcomes. Given that these could then be used with re-usable filters, this maintains choice for consumers.

Drink Bottles

Networks of water fountains in cities, tourist areas and at beaches (or any other high traffic area) can be installed, along with running of information campaigns, in order to avoid the need for bottles at all. Fountains are available in most cities, but not at the level of density where consumers can quickly find them.

To enable and encourage consumers to use refillable bottles, mobile applications can be developed to indicate to consumers where the nearest available refill points are, to ensure they are used. Producers could install soda machines for use with refillables bottles, rather than selling single use plastic bottles. Consumers would then bring refillable bottles to the outlet and purchase the volume of drink they require for their bottle. Food and drink retailers can sell water from refillable bottles, rather than selling single use plastic bottles. Many small cafes take this approach already and do not sell plastic water bottles at all.

Cotton Bud Sticks

There are companies that produces reusable sticks for cleaning ears, which are according to the supplier are more efficient and safer than cotton buds. In fact, many medical professionals do not recommend the use of cotton buds. Alternatively, paper stemmed (single use) and wood substitutes are now commercially available and indeed are the market norm in eg the USA.

Wet Wipes

Non-plastic alternatives to wet wipes used for personal care, for example make-up removal, already exist in the form of cotton pads or balls. Moreover, reusable alternatives to using wet wipes could include washable handkerchiefs or specially designed wipes, such as washable cloth Baby Wipes. Lotions (such as soaps, anti-bacterial gels, or make-up removal creams) could be applied to these wipes to achieve the desired result.

Sanitary Towels

Non-plastic alternatives for sanitary towels are not currently known. However, reusable sanitary towels, sanitary pads or menstrual pads are already available from a number of producers. These items are washable and reusable, and are usually made entirely of cotton, or of a mix of cotton or bamboo fibre with a waterproof poly-urethane layer.

Cutlery

Currently, there are 2 different situations where single use cutlery might be used, where food and drink establishments provide them to customers:

- use on the premises, mainly to save costs of washing reusable cutlery; or
- taking out with food which cannot be hand eaten for consumption on the go.

The latter is the most relevant to littering, whereas both relate to over-consumption of material.

Metal cutlery is the clear alternative and the majority of establishments make use of this approach. Therefore, washable items should be implemented for all eat-in sales. For take-out sales, reusable cutlery could be a clear alternative if consumers brought their own, and knew which outlets allowed this.

If single use items are necessary, then wood alternatives could be used, and are very common already through large stockists.

Straws and Stirrers

For many drinks, straws and stirrers are not needed at all, and could be eliminated, especially if certain drinks containers with detachable straws could be adapted to include integrate drinking spouts etc. Re-useable straws and stirrers are also available made out of glass or metal. Another option could be to innovate packaging design to build-in ‘straws’ to the pack itself, rather than have a separate disposal straw that could be littered.

If consumers found some disposable option necessary, wooden stirrers are commercially available. For straws, paper or bamboo alternatives are also very common and highly available.

Drinks Cups

Currently, there are 2 different situations where single use drinks cups might be used, where food and drink establishments provide single use cups to customers:

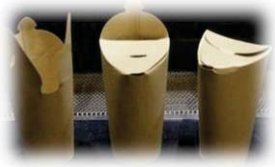
- drink on the premises, mainly to save costs of washing reusable cups; or
- taking out drinks for consumption on the go.

The latter is the most relevant to littering, whereas both relate to over-consumption of material.

Crockery is a clear MU alternative and many establishments already make use of this approach.

Take-away beverage sales for consumption on the go can readily be sold in reusable cups, which are now very well known. Moreover, some enterprises are also offering reusable cup clubs, which collect and return them to retailers. The Freiburg Cup scheme is a city based scheme that has been piloted along these lines, with 72 venues participating as of March 2017. The cup has a €1 deposit associated and it can be returned to any participating venue. At least 14,000 cups are in use. Deposit refund arrangements for ceramic mugs can also often be found in markets.

For customers where a reusable cup is not an option, then any single use beverage containers should be plastic free. Some paper cups that are classified as compostable, have a water proof layer as they are lined with plant-based Polylactic Acid (PLA). However, composting is only likely to work under industrial conditions, and the plastic may not fully degrade under other conditions – such as the marine environment. Consequently, SUNP alternative is not included in the analysis as lined cups are required for coffee to ensure the mechanical strength is maintained even when filled with very hot liquid for a certain length of time.



Regarding the lids, the design of the coffee cup itself could be changed to integrate a sipping spout, eliminating the need for separate lids altogether.

Food Containers

Currently, there are 3 different situations where single use food containers might be used, where food establishments provide single use containers to customers:

- to eat the food on the premises, mainly to save costs of washing reusable containers or plates;
- collecting food for consumption at home; or
- taking out food for consumption on the go.

The latter is the most relevant to littering, whereas all relate to over-consumption of material.

Crockery is a clear MU alternative and the majority of eat in establishments make use of this approach already. Eating take-away food on site might not always be possible with crockery, but reusable containers would be an obvious alternative (washable tiffins or multi-compartment trays).

For food markets and portable take-away outlets, portable washing stations can be hired to undertake the task of washing the reusable containers customers use to eat the food. In 2011, Vienna introduced an obligation to use reusable items at events with more than 1,000 people, where more than 500 people are attending in venues recognised as "permanent" by the Viennese MunicipalityMunicipality, or which are held on property owned by the Viennese MunicipalityMunicipality.

Alternatively, companies could provide a reusable container service to the street vendors: some companies do this, and each box can be used up to 2-300 times before it is eventually recycled. However, to ensure a high return rate for the boxes, a deposit refund type scheme might be needed.

For at home consumption of take-away meals, reusable containers can be used. These are already widely used in environmentally focused establishments, rather than single use plastics containers which are used by the majority. Consumers can purchase a metal tiffin, for example, for around €15-20 and take this to the takeaway outlet when they go to pick up the meal. They then wash it at home ready for the next visit. Or they could just bring a regular Tupperware-type box.

Where consumers are visiting take-away outlets and want to eat out 'on-the-go' the potential for utilising reusable containers is diminished. However, if this were not possible, then non-plastic containing single use containers are an alternative. Cardboard containers without plastic liners or biodegradable bagasse clamshells are already available at commercial scale.

In supermarkets, non-reheatable food to eat on the go is commonly served in single serve plastic packaging, so it will be important to ensure that standards and regulations are consistent for all food-to-go vendors – whether they are cafes and restaurants or supermarkets.

1.4 Feasibility of the Measures

For each product and measure, the rationale for the level of feasibility and a description of what the measures are trying to achieve – where relevant – are given (see Table 2 to Table 12). Some simplification of the list of measures has been made relative to what is included in the table above (see Table 1). The 'Specified Sales Restrictions', and 'Measures for Adoption by Public Authorities, including Green Public Procurement' have been merged into one category ('Sales Restrictions / Measures for Adoption by Public Authorities'). The measures included in this category are expected to be the type of measures that would be used to implement a reduction target (if such targets were introduced) and hence are not carried forward to the modelling stage. In addition, the two categories on EPR ('EPR for flushed items' and 'EPR – full cost coverage of litter collections') have been merged into 'EPR'.

Also, as indicated in Impact Assessment a range of related measures related to SUPs are in place or are due to be implemented in the next few years. However, there are no pilot studies for the items under consideration to evaluate feasibility. The technical feasibility is assessed here, with the economic feasibility within the Impact Assessment itself.

Table 2: Cigarette Butts

Measure	Feasibility and Aims
Information campaigns	Feasible. The aims of the campaign would be to inform smokers on the impacts of dropping cigarette butts, not only on beaches but also on land as many are washed into drains, and subsequently into the sea. This would include information on the packs themselves.
Mandatory labelling	Feasible. Labelling on packs of cigarettes, and on packs of filters.
Voluntary agreements, Voluntary commitments and pledges	Feasible. A voluntary agreement could be considered by the tobacco industry to reduce the plastic content in filters over time, which would convey towards the wider public that the tobacco industry is willing to contribute to marine litter solutions.
Specific Requirements on Product Design	Not feasible. No potential litter reduction design features were found.
Setting enhanced technical standards for WWTW and CSOs	Not relevant, items are not flushed.
EPR	Feasible. San Francisco, for example, has implemented a scheme in which the fee for cigarette manufacturers includes a component for the costs relating to litter which is based on the proportion of cigarette butts in litter counts.
Implement DRS	Not relevant, only relates to drinks bottles.
Sales restrictions / measures for adoption by public authorities	Not feasible. Although, in theory it might be possible to introduce bans on smoking outside in public places and/or on beaches.
Consumption levies	Feasible. The levy would be set such that a differential existed between SUP and NSUP alternatives.
Reduction targets (SUP)	Feasible. Alternatives are available, e.g. non-plastic filters
Reduction targets (all SU)	Not feasible. Reducing cigarette consumption or filter use overall goes beyond the scope of tackling the marine litter issue.
Ban (of SUP items)	Not feasible. MU alternative does not exist.
Ban (of all SU items)	Not feasible. MU alternative does not exist.

Table 3: Drinks bottles, caps and lids

Measure	Feasibility and Aims
Information campaigns	Feasible. The aim would be to run information campaigns to incentivise consumers to use water fountains, refillable bottles and other alternatives to the consumption of single-use bottles, as well as to ensure caps and lids are not littered. In addition, targeted campaigns for the HoReCa sector to install water fountains and soda streams in outlets, or to run refill schemes, and for municipalities to install water fountains in public spaces.
Mandatory labelling	Feasible. There may be issues with some very small bottles (e.g. miniatures sold in mini-bars), but otherwise, the measures could be readily adopted.
Voluntary agreements, Voluntary commitments and pledges	Feasible. Voluntary agreements could focus on reducing the use or sale of single-use plastic drinks bottles, switching to alternatives (including bottles made of other materials, or reusable bottles), or installing refillable schemes.
Specific Requirements on Product Design	Feasible. Design features could be incentivised or obliged to ensure that caps and lids are mechanically fixed to bottles (through tethers, for example) in order to reduce the incidence of littering.
Setting enhanced technical standards for WWTW and CSOs	Not relevant, items are not flushed.
EPR	Feasible. Drinks bottles are already subject to EPR fees in Member States, which could be further extended to ensure the fees cover a larger share of the costs incurred through the lifecycle. San Francisco, for example, has implemented a scheme in which the fee for cigarette manufacturers includes a component for the costs relating to litter which is based on the proportion of cigarette butts in litter counts. A similar scheme could be implemented for drinks bottles, caps and lids.
Implement DRS	Feasible. A number of EU Member States have already implemented a DRS for beverage containers. Several of them are achieving over 90% collection and recycling rate.
Sales restrictions / measures for adoption by public authorities	Feasible. Regulations could ban (public) venues from selling single-use drinks bottles for consumption on/off-site (see, for example, California), and public authorities could mandate the use of refillables at events under their influence.
Consumption levies	Feasible. Drinks bottles are a well-defined category of SUPs to which levies could be applied relatively straight-forwardly from a technical point of view (e.g. see current deposit refund systems for dinks bottles). The levy would be set such that a differential existed between SUP and non-SUP alternatives.
Reduction targets (SUP)	Feasible. There are alternatives that can be used in different contexts (see above: refillable bottles, bottles made of alternative materials, water fountains, etc.).
Reduction targets (all SU)	Feasible. Reusable alternatives exist (see above).
Ban (of SUP items)	Feasible. Both non-plastic single-use and multi-use alternatives exist (see above).
Ban (of all SU items)	Feasible. Multi-use alternatives exist (see above).

Table 4: Cotton bud sticks

Measure	Feasibility and Aims
Information campaigns	Feasible. Campaigns could focus on informing consumers about the impacts of flushing cotton buds down the drain or dropping on the ground when outdoors. Particularly using striking images such as the sea horse holding onto a cotton bud, which won a National Geographic photo competition.
Mandatory labelling	Feasible. The labelling would need to take place on packs of buds. This means that where buds are made openly available for consumers (in hotels, for example), the ability to influence through labelling would be lost.
Voluntary agreements, Voluntary commitments and pledges	Feasible. Large manufacturers and retailers of cotton buds are already taking voluntary initiatives to switch away from using plastic cotton buds to paper, so voluntary agreements to switch to non-plastic alternatives would seem highly feasible.
Specific Requirements on Product Design	Not feasible. No potential litter reduction design features were found.
Setting enhanced technical standards for WWTW and CSOs	Feasible. BAT to require minimum size of screen on inlet works at WWTW (6mm screen may be too large if cotton buds pass through end on, so might not capture all – smaller screens may not be feasible). Any by-pass from storm overflows should also be screened. Screens should be automated to reduce maintenance burdens. Actions should aim to capture large number of cotton buds flushed down toilets.
EPR	Feasible. San Francisco, for example, has implemented a scheme in which the fee for cigarette manufacturers includes a component for the costs relating to litter which is based on the proportion of cigarette butts in litter counts. Similar measures could be implemented for cotton bud sticks.
Implement DRS	Not relevant, only relates to drinks bottles.
Sales restrictions / measures for adoption by public authorities	Feasible. Green public procurement could be used to this end.
Consumption levies	Feasible. In this case though, the principle would be more based on cost recovery / demand reduction. The levy would be set such that a differential existed between SUP and non-SUP alternatives.
Reduction targets (SUP)	Feasible. As noted above under voluntary commitments reducing the plastic cotton bud stems is very feasible, and already occurring to a high extent in some Member States.
Reduction targets (all SU)	Feasible. Reusable alternatives do exist (U-Tips, for example) so reductions target would be feasible, but some consumers may still demand single use options.
Ban (of SUP items)	Feasible. As noted above, switching from plastic cotton bud stems to other materials is very feasible, and already occurring to a high extent in some Member States.
Ban (of all SU items)	Feasible. Reusable alternatives exist.

Table 5: Crisp packets & sweet wrappers

Measure	Feasibility and Aims
Information campaigns	Feasible. The aim of such campaigns would be to target on-the-go consumers at point of sale, in order to inform about the potential impacts of littering and provide information on the location of litter bins that could be utilised.
Mandatory labelling	Feasible. Labelling on packets and wrappers is rather straight-forward for larger items, while more complicated for small packaging (due to size and existing labelling requirements).
Voluntary agreements, Voluntary commitments and pledges	Feasible. The aims of any voluntary agreement are not entirely clear at this stage, but could cover increasing the collection of littered packets or innovating to reduce the plastic content.
Specific Requirements on Product Design	Not feasible. No potential litter reduction design features were found.
Setting enhanced technical standards for WWTW and CSOs	Not relevant, items are not flushed.
EPR	Feasible. San Francisco, for example, has implemented a scheme in which the fee for cigarette manufacturers includes a component for the costs relating to litter which is based on the proportion of cigarette butts in litter counts. Similar measures could be implemented for crisp packets and sweet wrappers.
Implement DRS	Not relevant, only relates to drinks bottles.
Sales restrictions / measures for adoption by public authorities	Not feasible. Unlikely to be possible to restrict the sales of crisp packets or sweet wrappers by location.
Consumption levies	Feasible. In this case though, the principle would be more based on cost recovery / demand reduction. The levy would be set such that a differential existed between SUP and non-SUP alternatives.
Reduction targets (SUP)	Not feasible. No tried and tested SUNP alternative exists (although some companies are seeking to develop non-plastics alternatives, e.g. foil and paper packaging).
Reduction targets (all SU)	Not feasible. No tried and tested SUNP alternative exists (although some companies are seeking to develop non-plastics alternatives, e.g. foil and paper packaging).
Ban (of SUP items)	Not feasible. Lack of alternatives. No MU packaging formats exist for these foodstuffs.
Ban (of all SU items)	Not feasible. Lack of alternatives. No MU packaging formats exist for these foodstuffs.

Table 6: Sanitary Towels

Measure	Feasibility and Aims
Information campaigns	Feasible. Aim to inform consumers of the impacts and stop flushing sanitary items down toilet systems.
Mandatory labelling	Feasible. The labelling would be required on packs being sold, and preferably, on individual items where these are individually packaged. The approach to individual labelling would make it far more likely that the label's message would be conveyed irrespective of whether the consumption was through retail, or other means.
Voluntary agreements, Voluntary commitments and pledges	Feasible. There may be the potential for voluntary agreements to be put in place where manufacturers look to reduce the plastic content of sanitary towel products.
Specific Requirements on Product Design	Not feasible. No potential litter reduction design features were found.
Setting enhanced technical standards for WWTW and CSOs	Feasible. BAT to require minimum size of screen on inlet works at WWTW (6mm screen should be sufficient). Any by-pass from storm overflows should also be screened. Screens should be automated to reduce maintenance burdens. Aim to capture large number of towels flushed down toilets.
EPR	Feasible. San Francisco, for example, has implemented a scheme in which the fee for cigarette manufacturers includes a component for the costs relating to litter which is based on the proportion of cigarette butts in litter counts. Similar measures could be implemented for sanitary towels.
Implement DRS	Not relevant, only relates to drinks bottles.
Sales restrictions / measures for adoption by public authorities	Feasible. Green Public Procurement approach could be used to this end.
Consumption levies	Feasible. The levy would be set such that a differential existed between SUP and non-SUP alternatives.
Reduction targets (SUP)	Feasible. SUNP are not widely available, but reusable sanitary towels, sanitary pads or menstrual pads are already on the market, as well as other reusable products having the same purpose. However, the market share for this approach may not be significant in the short term.
Reduction targets (all SU)	Feasible. Similar reasoning as above, given the availability of multi-use items.
Ban (of SUP items)	Not feasible. While alternatives exist, their market share is currently limited and due to the related sensitivity, it remains unclear how feasible scaling would be.
Ban (of all SU items)	Not feasible. As above.

Table 7: Wet Wipes

Measure	Feasibility and Aims
Information campaigns	Feasible. Aim to inform consumers of the impacts and stop flushing down toilet systems.
Mandatory labelling	Feasible. The labelling would be required on packs being sold, and preferably, on individual items where these are individually packaged. The approach to individual labelling would make it far more likely that the label's message would be conveyed irrespective of whether the consumption was through retail, or other means.
Voluntary agreements, Voluntary commitments and pledges	Feasible. There may be the potential for voluntary agreements to be put in place where manufacturers look to reduce the plastic content of sanitary towel products.
Specific Requirements on Product Design	Not feasible. No potential litter reduction design features were found.
Setting enhanced technical standards for WWTW and CSOs	Feasible. BAT to require minimum size of screen on inlet works at WWTW (6mm screen should be sufficient). Any by-pass from storm overflows should also be screened. Screens should be automated to reduce maintenance burdens. Aim to capture large number of wipes flushed down toilets.
EPR	Feasible. San Francisco, for example, has implemented a scheme in which the fee for cigarette manufacturers includes a component for the costs relating to litter which is based on the proportion of cigarette butts in litter counts. Similar measures could be implemented for wet wipes.
Implement DRS	Not relevant, only relates to drinks bottles.
Sales restrictions / measures for adoption by public authorities	Feasible. Green Public Procurement approach could be used to this end.
Consumption levies	Feasible. The levy would be set such that a differential existed between SUP and non-SUP alternatives.
Reduction targets (SUP)	Feasible. Non-plastic single-use and multi-use alternatives, like cotton and wool, were the precursor product to many wet wipes applications today. These and other non-plastic alternatives (including bamboo) are already on the market. There are also other MU alternatives to using wet wipes (e.g. washable handkerchiefs, anti-bacterial gels).
Reduction targets (all SU)	Feasible. SUNP and MU alternatives are already on the market.
Ban (of SUP items)	Feasible. SUNP and MU alternatives are already on the market.
Ban (of all SU items)	Feasible. SUNP and MU alternatives are already on the market.

Table 8: Cutlery

Measure	Feasibility and Aims
Information campaigns	Feasible. Campaigns could focus on giving consumers information about the impacts, and also encouraging them to ask to reusable cutlery at local food establishments they frequent. Other aims could be to target the HoReCa sector itself and provide information to them about the alternatives and costs/benefits (particularly CSR) from reducing reliance on SUP cutlery, or single-use items at all.
Mandatory labelling	Feasible. Limited to specific circumstances though as the labelling approach would only be effective where purchases were being made of bulk items (or packaged sets). To the extent that much of the consumption is through HoReCa, and free of charge, because the labelling of individual items is not deemed feasible, much of consumption would not be affected
Voluntary agreements, Voluntary commitments and pledges	Feasible. Agreements could be put in place in the HoReCa sector to reduce the reliance on single-use cutlery in food sale establishments, or from the manufacturers of cutlery to switch to other materials. In addition, voluntary agreements to charge consumers for any SU items used could be adopted.
Specific Requirements on Product Design	Not feasible. No potential litter reduction design features were found
Setting enhanced technical standards for WWTW and CSOs	Not relevant, items are not flushed.
EPR	Feasible. San Francisco, for example, has implemented a scheme in which the fee for cigarette manufacturers includes a component for the costs relating to litter which is based on the proportion of cigarette butts in litter counts. Similar measures could be implemented for cutlery.
Implement DRS	Not relevant, only relates to drinks bottles.
Sales restrictions / measures for adoption by public authorities	Feasible. Restricting the sale of SUP, or any single-use, cutlery item for use on-site would be a measure to this end (i.e. single use items would only be available for on-the-go consumption). Moreover, use of SU(P) items could be restricted through procurement policy by public authorities.
Consumption levies	Feasible. The levy would be set such that a differential existed between SUP and non-SUP alternatives.
Reduction targets (SUP)	Feasible. SUNP and MU alternatives are already widely available.
Reduction targets (all SU)	Feasible. SUNP and MU alternatives are already widely available.
Ban (of SUP items)	Feasible. SUNP and MU alternatives are already widely available.
Ban (of all SU items)	Feasible. SUNP and MU alternatives are already widely available.

Table 9: Straws and Stirrers

Measure	Feasibility and Aims
Information campaigns	Feasible. There are already many campaigns targeting the reduction in use of plastic straws, by providing information about the impacts and alternatives.
Mandatory labelling	Feasible. Limited to specific circumstances though as the labelling approach would only be effective where purchases were being made of bulk items (or packaged sets). To the extent that much of the consumption is through HoReCa, and free of charge, because the labelling of individual items is not deemed feasible, much of consumption would not be affected
Voluntary agreements, Voluntary commitments and pledges	Feasible. Many companies are already replacing plastics straws with paper alternatives on a voluntary basis.
Specific Requirements on Product Design	Feasible. The aim of any minimum requirements measure related to straws would be to seek to innovate packaging design to build-in 'straws' to the pack itself, rather than have a separate disposal straw that could be littered .
Setting enhanced technical standards for WWTW and CSOs	Not relevant, items are not flushed.
EPR	Feasible. San Francisco, for example, has implemented a scheme in which the fee for cigarette manufacturers includes a component for the costs relating to litter which is based on the proportion of cigarette butts in litter counts. Similar measures could be implemented forstraws and stirrers.
Implement DRS	Not relevant, only relates to drinks bottles.
Sales restrictions / measures for adoption by public authorities	Feasible. Restricting the sale of SUP, or any single use, straw/stirrer item for use on-site would be a measure to this end (i.e. single use items would only be available for on-the-go consumption). Moreover SU(P) items could be restricted through procurement policy by public authorities.
Consumption levies	Feasible. The levy would be set such that a differential existed between SUP and non-SUP alternatives.
Reduction targets (SUP)	Feasible. SUNP and MU alternatives are already widely available.
Reduction targets (all SU)	Feasible. SUNP and MU alternatives are already widely available.
Ban (of SUP items)	Feasible. SUNP and MU alternatives are already widely available.
Ban (of all SU items)	Feasible. SUNP and MU alternatives are already widely available.

Table 10: Food containers (including fast food containers)

Measure	Feasibility and Aims
Information campaigns	Feasible. The aims of any information campaigns would be 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).
Mandatory labelling	Feasible. Clearly, where consumers are buying from retail, then the packs of containers would also be suitable for labelling.
Voluntary agreements, Voluntary commitments and pledges	Feasible. Voluntary agreements could target suppliers and users of SUP food containers to switch to non-plastic alternatives, and/or for local food establishments to offer discounts for consumers bringing their own containers or setup communal reusable box schemes.
Specific Requirements on Product Design	Not feasible. No potential litter reduction design features were found.
Setting enhanced technical standards for WWTW and CSOs	Not relevant, items are not flushed.
EPR	Feasible. San Francisco, for example, has implemented a scheme in which the fee for cigarette manufacturers includes a component for the costs relating to litter which is based on the proportion of cigarette butts in litter counts. Similar measures could be implemented for food containers
Implement DRS	Not relevant, only relates to drinks bottles.
Consumption levies	Feasible. More likely to lead to substitution (by SUNPs and MU) where SUP items are filled at the point of sale.
Sales restrictions / measures for adoption by public authorities	Feasible. Restricting the sale of SUP, or any single-use, food container for use on-site would be a measure to this end (i.e. single use items would only be available for on-the-go consumption). Moreover SU(P) food containers could be restricted through procurement policy by public authorities.
Reduction targets (SUP)	Feasible. SUNP and MU alternatives are already widely available.
Reduction targets (all SU)	Feasible. SUNP and MU alternatives are already widely available.
Ban (of SUP items)	Feasible. SUNP and MU alternatives are already widely available.
Ban (of all SU items)	Feasible. SUNP and MU alternatives are already widely available.

Table 11: Cups and cup lids

Measure	Feasibility and Aims
Information campaigns	Feasible. Campaign aims would be to help incentivise consumers to use their own reusable cups and for beverage outlets to think about offering their own branded cups and what benefits they might achieve from this, in terms of reduced financial costs or increased CSR.
Mandatory labelling	Feasible. In particular for SUP cups, as the measure might be slightly more difficult for lids. However, the labelling on the cup could draw attention also to the need to take responsibility for the lid. Clearly, where consumers are buying from retail, then the packs of cups / lids would also be suitable for labelling.
Voluntary agreements, Voluntary commitments and pledges	Feasible. A range of voluntary agreements could be imagined. Firstly, for retailers to offer discounts for consumers bringing their own cups, or to offer reusable cups for sale in all stores, or to stop using single use cups at all. Secondly, manufacturers of cups could set up voluntary agreements to phase out the plastic content of the cups and lids over time.
Specific Requirements on Product Design	Feasible. Some innovation in minimum requirements might be possible, particularly around integrating sipping lids into the cups rather than having separate items, as shown by a winner of the Ellen MacArthur Foundation's innovation prize.
Setting enhanced technical standards for WWTW and CSOs	Not relevant, items are not flushed.
EPR	Feasible. San Francisco, for example, has implemented a scheme in which the fee for cigarette manufacturers includes a component for the costs relating to litter which is based on the proportion of cigarette butts in litter counts. Similar measures could be implemented for cups and cup lids
Implement DRS	Not relevant, only relates to drinks bottles.
Sales restrictions / measures for adoption by public authorities	Feasible. Restricting the sale of SUP , or any single-use, cup / lid for use on-site would be a measure to this end (i.e. single use items would only be available for on-the-go consumption). Moreover SU(P) items could be restricted through procurement policy by public authorities.
Consumption levies	Feasible. The levy would be set such that a differential existed between SUP and non-SUP alternatives.
Reduction targets (SUP)	Feasible. Reusable alternatives are clearly available. However, regarding potential SUNP alternatives, most cups would still have a a plastic liner that ensures the mechanical strength of the alternative outer material (e.g. cardboard) does not degrade through water infiltration.
Reduction targets (all SU)	Feasible. Reusable alternatives are available, though demand for on-the-go consumption of beverages is strong so the extent of any reduction might be limited.
Ban (of SUP items)	Feasibility. Reusable alternatives are already widely available , while SUNPs could be a viable alternative soon, assuming the liner challenge gets solved.
Ban (of all SU items)	Feasible. Reusable alternatives are already widely available, while SUNPs could be a viable alternative soon, assuming the liner challenge gets solved.

Table 12: Balloons and Balloon Sticks

Measure	Feasibility and Aims
Information campaigns	Feasible. Campaign aims would be to discourage balloon releases, and encourage the use of alternatives to SUP sticks
Labelling	Feasible. Limited to packs of balloons and sticks, unlikely to be feasible for single items (although possible to have labelling that appears on balloons once inflated).
Voluntary measures	Feasible. A range of voluntary agreements could be imagined: eliminating SUP balloon sticks; voluntary information campaigns; seeking to ensure products were not made available at / for mass release events.
Specific Requirements on Product Design	Not feasible. No potential litter reduction design features were found.
Setting enhanced technical standards for WWTW and CSOs	Not relevant, items are not flushed.
EPR	Feasible. San Francisco, for example, has implemented a scheme in which the fee for cigarette manufacturers includes a component for the costs relating to litter which is based on the proportion of cigarette butts in litter counts. Similar measures could be implemented for balloons and balloon sticks.
Implement DRS	Not relevant, only relates to drinks bottles.
Sales restrictions / measures for adoption by public authorities	Feasible. In particular, in terms of limiting the licensing of mass releases at events, and through general licensing of events. If public authorities purchase balloon sticks, they could seek to procure alternatives to SUPs.
Consumption levies	Feasible. The levy would be set such that a differential existed between SUP and non-SUP alternatives.
Reduction targets (SUP)	Feasible. Mainly limited to balloon sticks. There are fewer obvious SUP alternatives to balloons but that does not necessarily prevent implementation of reduction targets.
Reduction targets (all SU)	Feasible. See above.
Ban (of SUP items)	Feasible. Mainly limited to balloon sticks, as lack of alternatives make it less likely to be feasible for balloons.
Ban (of all SU items)	Feasible. See above.

1.5 Product-Measure Matrix

The table below shows a summary of the feasibility of the products and measures under consideration. The colour coding is as follows:

- Feasible = Green
- Not feasible = Grey

Table 13: Measure-Feasibility matrix

Product	Information campaigns	Labelling	Voluntary agreements, Voluntary	Specific Requirements on Product Design	Setting enhanced technical standards for	EPR	Sales restrictions / measures for adoption	DRS	Consumption levies	Reduction targets (SUP)	Reduction targets (all SU)	Ban (of SUP items)	Ban (of all SU items)
Cigarette filters													
Drinks bottles													
Cotton bud sticks													
Crisp packets and Sweet wrappers													
Wet wipes													
Sanitary towels													
Cutlery													
Straws and Stirrers													
Drinks cups and lids													
Food containers													

Items outside the quantified analysis of the impact assessment

Items outside of the Top Ten commonly found in marine litter are listed below, along with some alternatives.

- Strapping bands: alternatives could include metal strapping for heavy loads, or reusable polyester bands with buckles for smaller goods. String could be used for light goods.
- Shotgun cartridges: cartridges with paper cases exist, and were used historically.
- Cigarette lighters: MU cigarette lighters are very common and would make a clear alternative.
- 4/6 pack yokes, six-pack rings: yokes and rings could be dispensed of altogether and packs of 4 to 6 could be packaged in cardboard, as are larger packs.

- Lolly sticks: paper and wood lolly sticks are already readily available and could be used as an alternative to plastic.
- Tobacco pouches / plastic cigarette packaging: there is a question as to whether these items are SU, but they still do appear in beach litter counts so could be targeted. Pipe smokers often have tobacco cases or pouches, so multi-use alternatives could be foreseen.
- Nappies: reusable baby nappies are already widely used as are washable incontinence pants.
- Plastic bags: given the switch in consumer behaviour brought about by measures in place from Member States or in response to the Plastic Bags Directive, no further analysis was undertaken.

The above shows that there are many SUNP and MU alternatives for the other SUP items that appear in beach litter counts. Policies at the Member State level could also target these items in order to further reduce the amount of SUP litter entering the marine environment.

1.6 Key model Data

The support study (Eunomia et al) sets out the key model data. This includes the current levels of consumption for each item and type and the compound annual growth rate (CAGR) is provided. Growth forecasts indicate that the consumption of nearly all SUP items are projected to increase out to 2030. The only items that are expected to decrease are cigarette butts and plastic cotton buds.

Table 16 shows the current recycling rates determined through a step-by-step assessment of the parameters of existing waste collection systems, and the physical characteristics of the items in question. Recycling of these items is very low for most, with the exception of beverage bottles and food containers.

Table 14: Baseline recycling assumptions for specific single-use items.

Item	Item class	Final Recycling Rate
Cigarette butts	SUP	0%
	SUNP	0%
Drinks bottles, Caps and lids	SUP	52%
	SUNP	61%
Cotton bud sticks	SUP	1%
	SUNP	1%
Crisps packets / sweets wrappers	SUP	0%
	SUNP	9%
Wet-wipes	SUP	0%
	SUNP	39%
Sanitary towels and tampons	SUP	0%
	SUNP	-
Cutlery	SUP	1%
	SUNP	10%
Straws	SUP	0.6%
	SUNP	10%

Item	Item class	Final Recycling Rate
Stirrers	SUP	0%
	SUNP	10%
Drinks cups and cup lids	SUP	1.5%
	SUNP	10%
Food containers including fast food packaging	SUP	5%
	SUNP	10%

Finally, the littering rates calculated in the model are presented below. These indicate that rates vary by item. It should be noted that the data underpinning these estimates is very scarce and so should be considered indicative only.

Table 15: Littering rates of different items

Item	kg/capita littered	Tonnes littered	Consumption, EU 28, tonnes	SUP littering rate	SUNP littering rate	MU littering rate	Found in Marine Environment (tonnes)
Cigarette filters	0.014	2,416	7,531	32.1%	32.1%	-	121
Drinks bottles	0.37	187,388	2,703,641	6.9%	6.9%	0.0%	9,369
Cotton buds	0.00	1,337	9,547	14.0%	14.0%	0.0%	67
Crisp packets	0.02	4,370	117,045	3.7%	3.7%	-	219
Sweet wrappers	0.00	4,370	138,965	3.1%	3.1%	-	219
Wet wipes	0.00	14,793	47,720	31.0%	31.0%	0.0%	740
Sanitary towels	0.00	25,767	122,698	21.0%	21.0%	0.1%	1,288
Cutlery	0.00	959	206,605	0.46%	0.5%	0.0%	48
Straws	0.005	2,771	88,450	3.1%	3.1%	0.0%	139
Stirrers	0.00	213	139,252	0.2%	0.2%	0.0%	11
Drinks cups & lids	0.16	39,865	302,417	13.2%	13.2%	0.0%	1,993
Food containers	0.11	27,820	544,382	5.1%	5.1%	0.0%	1,391

For the single-use plastic items considered here, the total tonnage of items dropped as litter is estimated to be 270,174 tonnes, while the tonnage of items flushed sums to 41,896 tonnes. Of a total of 312,070 tonnes of items, the amount then entering the marine environment is calculated to be 15,604 tonnes. This takes into account the proportion of improperly flushed items removed during waste water treatment.

1.7 Assumptions

This section considers the key assumptions that were made to model the future effects of the various scenarios being assessed.

Note, a x% reduction indicates a reduction of x% of 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 fates (for example, 70% indicates a recycling rate of 70% was modelled).

Table 16: Approach to modelling the scenarios

Scenario	Approach to Modelling
Information campaigns	Without broader policy changes, information campaigns might be limited in their affect. 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. The following changes are modelled under this scenario for all items: ■ Littering / flushing rate decreases by 2%, 5% and 10% by 2020, 2025 and 2030 respectively; ■ Littering collection rates remain at baseline level; ■ Recycling rates remain at baseline levels; and ■ Consumption switches from SUP to SUNP and MU by 5 percentage points each by 2030 (where alternatives already exist e.g. all except, MU cigarette filters, SUNP sanitary towels, SUNP drinks cups and SUNP/MU crisp packets/sweet wrappers), and by 2 percentage points for MU sanitary towels only as rates are currently higher than the other items.
Voluntary actions	Voluntary actions are most effective where there is a back-stop of policy intervention if agreements are not effective in delivering change. VAs are more likely to be effective where they align with the commercial and reputational outlook of businesses, for example, where non-plastic alternatives are already in place, and the measures taken result in limited, or negative costs, and improved public image. The following changes are modelled under this scenario: ■ Littering / flushing rate decreases by 2%, 5% and 10% by 2020, 2025 and 2030 respectively; ■ Litter collection rate increases by 5% for all non-flushed items – they magnitude of the change is less than the litter reduction rate as increased collection implies a change in cost rather than just behaviour, which would limit the change; ■ Recycling rates remain at baseline levels; ■ Consumption switches from SUP to SUNP by 10 percentage points each for cotton buds, straws, stirrers, food containers and cutlery (items were producers are more likely to target campaigns, as already existing public support); and ■ Consumption switches from SUP to MU by 5 percentage points each for straws, stirrers, cutlery, drinks bottles, drinks cups and food containers (items where consumers can make switches to MU items from well-understood easy to use alternatives).
Essential Requirements on Product Design	This measure is modelled focusing on the specific items being targeted. The key changes modelled are: ■ The unit weight of plastic bottles increase by 2% in order to estimate the increased material requirement from the leashes. Material requirements for integrated lids or straws may not change, and currently there are few examples so no change in unit weight is modelled;

Scenario	Approach to Modelling
	■ Littering rates reduced by 5% by 2030 for all items assuming that some consumers stop littering; ■ Collection rates increase by 5% by 2030 for plastic bottles to represent the increased collection of the caps themselves, by 25% for cup lids, assuming there are limits to how many consumers may purchase integrated lid versions, and by 50% for straws assuming there are market limitations where straws are not sold with beverages; ■ Recycling rates for plastic bottles increase by 1% to represent minor increases in recycling of caps which would also be collected alongside bottles, other items remain at baseline levels; and ■ Item types remain at baseline consumption levels.
BAT for WWTW and CSOs	This measure would affect a limited range of items that are flushed down drains, e.g. cotton buds, wet wipes and sanitary towels, and also cigarette butts that are washed down surface water drains in periods of rainfall. It was assumed that this measure would target BAT for the water treatment industry, and additional screening would be implemented to reduce leakage into the environment. The following changes are modelled under this scenario for all items: ■ Improperly flushed items collection rate increases by 50% for sanitary towels and wet-wipes and 25% for cotton buds by 2030 (the latter is deemed lower as cotton buds could still passed through 3mm screens end on).
EPR for improperly flushed items	As per scenario above but costs fall on producers, not water companies.
EPR – full cost coverage of litter collections	In terms of the modelling for this analysis, we take the estimated total contribution of the top ten items in terrestrial litter and beach litter into account. For floor litter, by weight, this is estimated at around 15%. Litter surveys do not use categories with enough disaggregation to be able to identify the contribution of all items modelled in this study, however, some further disaggregation is available. 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. The following changes are modelled under this scenario for all non-flushed items: ■ 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 (10% by 2020 and 30% by 2025). ■ Litter clean-up costs double.
Sales restrictions (inc. events, GPP)	The magnitude of the effect from this measure would depend upon the proportion of the market which serviced events or public sector institutions, as well as the amount of drinks and food items sold for consumption on-site versus on-the-go. The scale of the public sector can be significant in some countries and is not likely to be trivial in any. The approach taken is: ■ Consumption switches from SUP to MU by 25% each for straws, stirrers, cutlery, drinks bottles and drinks cups by 2030; and ■ An overall reduction in consumption of 25% of straws and stirrers by 2020. No change to littering or recycling rates are modelled.
Implement DRS	Three primary effects are modelled due to implementation of a DRS. Firstly, recycling rates are assumed to increase to 90%.38 Secondly, the initial litter rate

[38] http://infinitum.no/english/the-deposit-system

Scenario	Approach to Modelling
	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 2025. The following changes are therefore modelled under this scenario for plastic beverage bottles only: ■ Recycling rate increases to 90%; ■ Litter rate reduces to 80% of the baseline level; and ■ Litter collection rate increases by 50%. The overall outcome regarding litter is that littering is reduced by 90% compared to baseline levels, with only 10% of what was littered still remaining in the terrestrial or entering the marine environment. In terms of the modelling, the costs shown are the net costs to business – this has been reduced by income to business from unclaimed deposits, which could be taken as a cost for consumers.
Consumption levies	The measure was modelled by assuming a levy at the point of consumption was put in place for these items: ■ Cutlery ■ Straws ■ Stirrers ■ Cotton buds ■ Drinks cups / lids ■ Drinks bottles ■ Food containers 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, as for carrier bags. The level of the charge is up to around €0.10 in many Member States, so this 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 food/drink product being sold (drinks cups, drinks bottles and food containers) the consumer feels the overall cost of the product + packaging, and so the levy would need to be higher to have a similar effect – consequently, a more significant charge of €0.25 was modelled. 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 those items which are currently given away for free and not integrated into the purchased product (cutlery, straws and stirrers), the price effect is in line with that for carrier bags, i.e. an 80% reduction for a €0.10 charge. For cotton buds, the level of the levy would be lower (a €0.01 charge would double the cost of the product, for example), but given the upcoming availability of alternative non-plastic alternatives, it is assumed that the levy would result in a 95% reduction in consumption of SUNP cotton buds is achieved. For drinks cups, evidence from a study in Wales suggests that consumers take the price increase relative to the product price into account, and so the demand reduction is less significant.39 We have used the figure from this study to model the reduction of 30% consumption of SUP drinks cups, drinks bottles and food containers in response to a €0.25 charge. The nature of the

[39] Eunomia contributed to the report 'Disposable Packaging: Coffee Cups' published by the House of Commons' Environmental Audit Committee, December 2017.

Scenario	Approach to Modelling
	alternative could either be MU if the consumer decides to switch to a reusable product to avoid the levy, or SUNP if the retailers switch material use, also to avoid consumers having to pay the levy (which would reduce demand for their products). The timing of introduction of the levies is assumed to be the following, giving additional time for some items to develop alternatives and behaviours to adapt: ■ Cutlery – 2020 ■ Straws – 2020 ■ Stirrers – 2020 ■ Cotton buds – 2020 ■ Drinks bottles – 2025 ■ Food containers – 2025 ■ Drinks cups / lids – 2030 The % reduction of SUP relates to a consumption switch to SUNP and MU, these vary depending on item type (see below). In addition, for straws and stirrers, the total level of consumption of those items is reduced by 50% as consumers decide they no longer need the items at all. No change to littering or recycling rates are modelled.
Reduction targets (SUP)	Reduction targets are set differently depending on the existence of SUNP alternatives. The % reduction of SUP relates to a consumption switch to SUNP and MU, these vary depending on item type (where MU alternatives are available). In addition, for straws and stirrers, the total level of consumption of those items is reduced by 50% as consumers decide they no longer need the items at all. No change to littering or recycling rates are modelled.
Reduction targets (all SU)	Reduction targets are set differently depending on the existence of MU alternatives. In addition, for straws and stirrers, the total level of consumption of those items is reduced by 50% as consumers decide they no longer need the items at all. No change to littering or recycling rates are modelled.
Ban (of SUP items)	The approach to modelling bans is to assumed a 100% reduction of the consumption of SUP items, where MU alternatives exist that could be adopted by the whole market (some items, such as sanitary are excluded as it is assumed not all users would shift to MU). The period for the reduction is set between 2 and 12 years depending on item. This relates to the current availability of alternatives, time needed for behaviour change (i.e. a shift to an unfamiliar approach) and the likely time innovation might need to take to deliver new approaches. No change to littering or recycling rates are modelled.
Ban (of all SU items)	As above, but a complete switch from SUP and SUNP to MU by the given years.

The model has the following limitations:

- Market data was not available for all countries so had to be estimated using GDP per PPP.
- Fates factors averaged for all of the EU in some cases.
- Forecasts are based on expert judgement as pilot studies / trials / countrywide 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.
- Evidence and impacts on marine wildlife still being understood.
- Cannot value water and land use, and so compare these impacts in monetary terms against the rest of the costs and benefits.

1.8 Life Cycle Analysis

Products bring about impacts not just from their manufacturing, but also from the sourcing of raw materials for their production, their usage and end-of-life, as well as due to logistics for transportation. Also alternatives to single-use plastics need to consider the full life-cycle impacts. Life-cycle analysis (LCA) was performed for nine widely-used single-use plastics products (SUPs) and their single-use non-plastic alternatives (SUNPs), as well as reusable alternatives (multi-use; MU), with the aim of answering the following question:

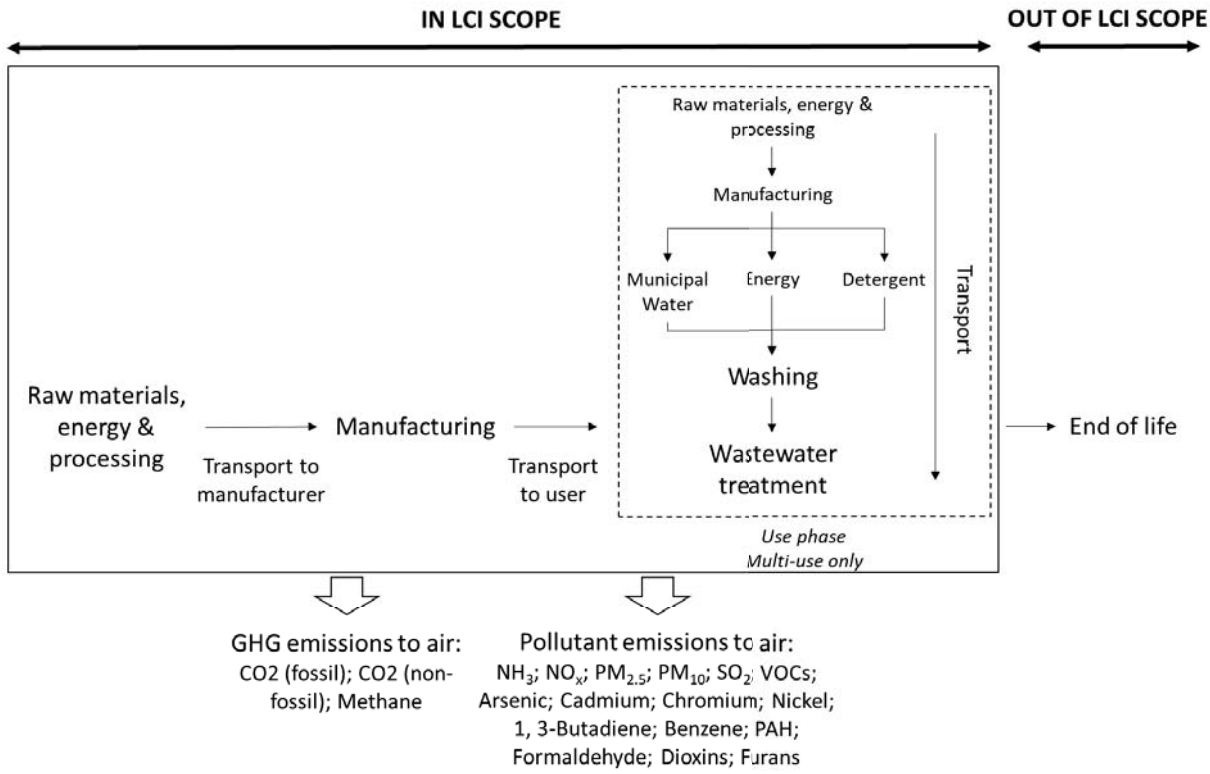
"*If single-use plastics products were replaced by either single-use non-plastics alternatives or multi-use items, what would the impact be on greenhouse gas and air pollutant emissions?"*

The life-cycle study involved building life-cycle inventories of the single-use plastics and their alternatives. CO_2, CH_4 and sixteen types of air pollutants were considered. The life-cycle inventories of the product systems under consideration supplement the analysis of plastics & their alternatives end-of-life, thus contributing to the overall life-cycle view of the Impact Assessment.

Methodology

Functional unit - one use of a product in question or of its alternative(s). For single-use plastic and non-plastic items, this equates to the production of 1 item. For multi-use items, this is the production of 1 item divided by its number of reuses, plus the burdens of 1 wash cycle.

Figure 3. System boundaries of the of the life cycle inventories and emissions considered



Data sources & system boundaries - The life-cycle inventories complied are based on Ecoinvent v3.4 for both foreground and background data (Wernet et al., 2016). End-of-life treatment is excluded from the LCI scope due to end-of-life fates being considered separately in the Impact Assessment model. Figure 3 illustrates the system boundary of all products considered, as well as the emissions included in the compilation of their life-cycle inventories.

In total, twelve products & their potential alternatives were considered for modelling. In choosing the reference products for each product category the most widely used products have been selected. The criteria for selection of plastics alternatives were that:

- The materials of which SUNP items are composed avoid the generation of microplastics
- Alternative products meet the same function as the plastic products that they substitute in terms of properties that the materials ensure.
- Multi-use items need to ensure that use of single-use plastics is avoided.
- Alternatives need to satisfy broadly the same market.

Washing and reusability of multi-use items - datasets were compiled from Ecoinvent data. Due to the reusability of multi-use items, their burdens up to and including the manufacturing stage would be small and the product system would thus be dominated by its use (washing).

Use of the life cycle inventory

The life-cycle inventory compilation was fed into the model. As the compiled life-cycle inventories are fed into the general Impact Assessment model, they should not be interpreted

in isolation with respect to preference of SUP, SUNP or MU items. While care has been taken in the selection of reference products & alternatives, life-cycle assessment studies do not account for all possible characteristics of particular items. What is more, the preference for certain items over others may lie with characteristics that have not been accounted for in this work.

2 Impacts of the options

The modelling below shows the magnitude of impacts that would be likely to take place.

2.1 Changes in the Baseline

Firstly, the key changes under the baseline from 2018 to 2030 are presented to understand against what parameters the scenarios be being assessed against. The main changes relate to national policies regarding tackling cotton buds, and cutlery / drinks cups in France.

Table 17: Change in Consumption under the Baseline (2018 to 2030)

Item	SUP	SUNP	MU
Cigarette filters	0%	0%	0%
Drinks bottles	0%	0%	0%
Cotton buds	-24%	25%	-1%
Crisp packets / sweet wrappers	0%	0%	0%
Wet wipes	0%	0%	0%
Sanitary towels	0%	0%	0%
Cutlery	5%	-3%	-2%
Straws	0%	0%	0%
Stirrers	0%	0%	0%
Drinks cups and lids	1%	0%	-1%
Food containers	-2%	2%	0%

The next table shows the main changes in the way the items are managed under the baseline.

Table 18: Change in Waste Management Routes under the Baseline (2018 to 2030)

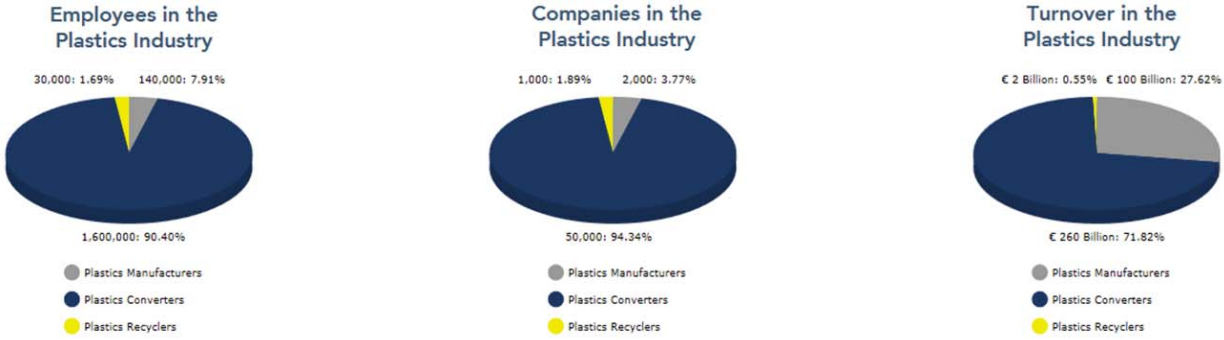
Item	Recycling	Incineration	Landfill	Litter - remains in terrestrial	Litter - remains in marine
Cigarette filters	0.0%	30%	-29%	-0.37%	-0.37%
Drinks bottles	9.0%	-4%	-5%	-0.05%	-0.05%
Cotton buds	-0.4%	21%	-20%	-0.12%	-0.12%
Crisp packets / sweet wrappers	0.0%	35%	-35%	-0.06%	-0.06%
Wet wipes	0.0%	28%	-28%	-0.05%	-0.05%
Sanitary towels	0.0%	23%	-23%	-0.27%	-0.27%
Cutlery	0.0%	20%	-20%	-0.18%	-0.18%
Straws	4.7%	18%	-22%	0.00%	0.00%
Stirrers	4.8%	17%	-22%	-0.02%	-0.02%
Drinks cups and lids	-0.3%	19%	-19%	0.00%	0.00%
Food containers	4.7%	17%	-22%	-0.10%	-0.10%

The changes assume relatively minimal changes in littering behaviour, and reflect the fact that the main change deemed likely to occur as a result of the implementation of the Baseline policies is a shift away from landfill due to the landfill reduction target in 2035. Because many of the items are so difficult to recycle because of their small size, for many items, the principle shift in the Baseline option 1 is away from landfill and into incineration. For some items, such as drinks bottles and food containers, the increase in the packaging recycling targets, as well as the requirement for recyclability, lead to increases in recycling. Some reductions in littering are also seen from various policies.

2.2 EU – global production

Whilst it is not possible to look at the EU – global split in modelling terms, it is possible to provide some complementary discussion of the EU-global market. Overall, production seems to be largely outside of the EU. Half of plastics production is located in Asia and 19% in Europe. In terms of employment and turnover plastic converters are more significant in the EU economy.

Table 19: EU and global production



(source EUPC)

Placing on the EU market of SUP items has increased rapidly over recent years. Whilst detailed production data is not available specifically for SUP (or products identified as most likely to be littered), the preliminary analysis suggests that most of these are produced outside Europe. Europe's positive trade balance in plastics and plastic products tends to be in higher added-value and more durable products. In 2016 about 7.4% of demand for plastic by EU plastics converters was for PET, which tends to be used for drinks bottles; about 19.3% was for PP which is used for food containers, sweet wrappers and caps (but also for automotive parts, pipes, bank notes and other uses). Nearly 40% of EU plastics converters demand was related to packaging of all types.

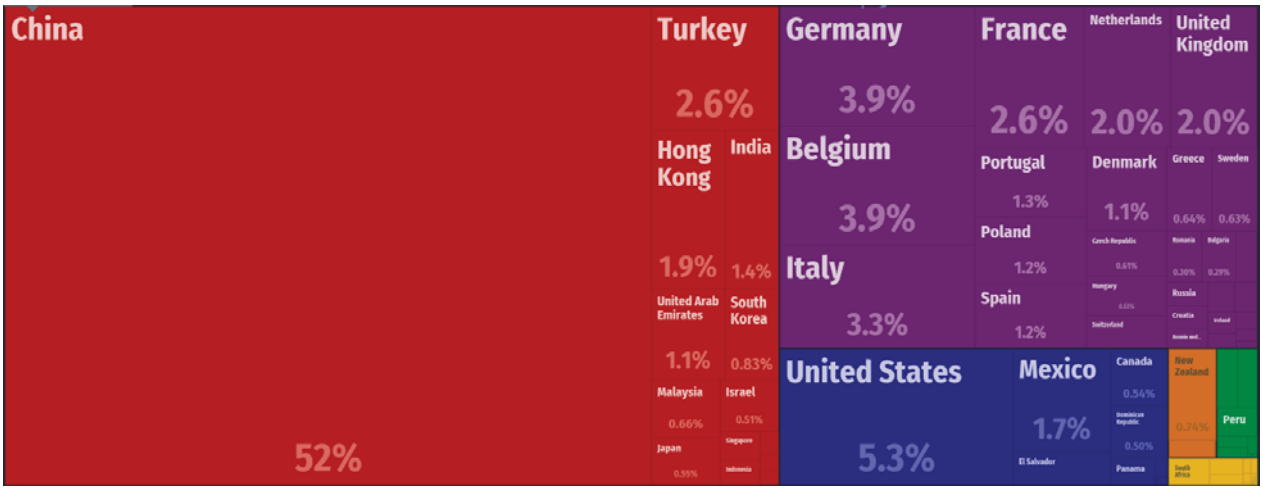
There is no comprehensive and detailed information available on what proportion of the products put on the market by EU and non-EU plastics converters is composed of the items identified as most likely to be littered. The sector is generally expanding rapidly, for example global rigid plastic packaging consumption will rise at an annual rate of 3.7% from 52.9 million tonnes in 2017 to 63.4 million tonnes in 2022[40], the possibilities to divert from production of low-value disposable SUP products to other markets is therefore clear. Although production of SUP items has increased rapidly over recent years, these products are also by definition low-value and therefore have relatively high volume and low profit

40 https://www.smitherspira.com/industry-market-reports/packaging/the-future-of-rigid-plastic-packaging-to-2022

margins. Higher value products for construction, insulation, agriculture, automotive, telecommunications and electronics industries tend to be made with other types of plastic (PE, PVC, PUR, PS and others) which account for more than 70% of EU demand from plastics converters (source Plastics Europe).

Data is available on the exports and imports of certain SUPs, for example in respect of plastic table and kitchenware, China accounted for more than 50% of global exports, and EU Member States for just over 25%. Table 22a-d show this data.[41]

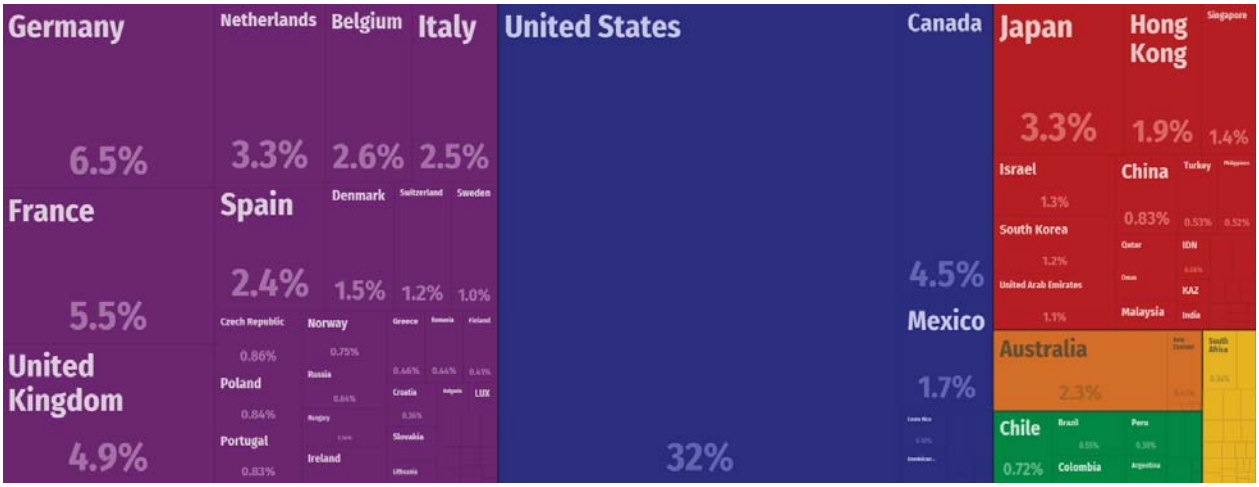
Table 20: Exports | Global – EU country splits



source: https://atlas.media.mit.edu/en/profile/hs92/392410/

The EU accounted however for about 40% of global imports.

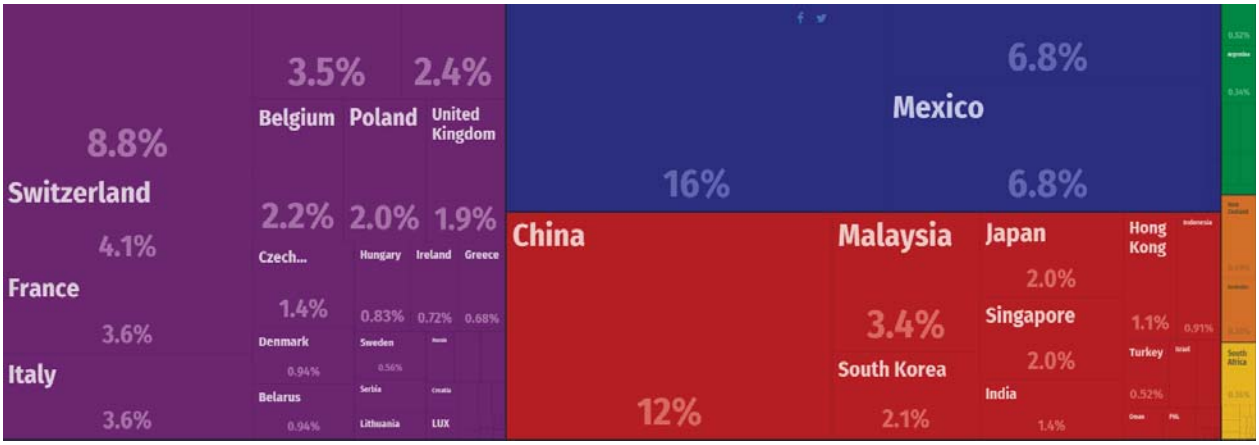
Table 21: Imports | Global – EU country splits



Data on which countries export plastic articles for goods conveyance or packing (2016) reveals that the EU is more present, with about 31% of global export markets.

41 source: https://atlas.media.mit.edu/en/profile/hs92/392410/ and https://atlas.media.mit.edu/en/visualize/tree_map/hs92/import/show/all/392390/2016/

Table 22: Exports Conveyance/packaging | Global – EU country splits



The EU acounts for about 32% of global imports.

Table 23: Exports Conveyance/packaging | Global – EU country splits

source: https://atlas.media.mit.edu/en/visualize/tree_map/hs92/import/show/all/392390/2016/

Empirical research backs up the notion that the vast majority of SUP supplies originate outside the EU, and principally in Asia. An internet search for suppliers of plastic stirrers by location reveals 127 suppliers located in the EU, compared with 214,112 in China, 4,982 in Honk Kong and 1025 in Vietnam. Industry estimates on balloon sticks suggest that more than 50% come from China, but that between 50 and 75% of balloons on the EU market (total market of about €540m p.a.) are manufactured in the EU.

2.3 Product ladders and sub-options

For each individual product, a ladder was created setting out the effectiveness of different feasible measures and their costs (see Eunomia report).

The different product ladders provide together almost 100 measures. In terms of expressing the analysis in a digestible way, these measures were combined into four sub options. Each sub option effectively considers measures to be implemented for each specific item and is assessed for its effects relative to the Baseline, Option 1. The sub options move to

progressively more ambitious measures – in terms of the impact they have on SUPs entering the marine environment – as one moves through these options, these being:

- Option 2a lowest impact
- Option 2b medium impact
- Option 2c medium-high impact
- Option 2d highest impact

The choice of measures under each option are indicated below.

Table 24: SUP product-measure matrix with modelled measures in each sub-option (2a to 2d)

Product	Information campaigns	Voluntary action	Label	EPR ~ cost of litter	Product Design	DRS for beverage containers	Reduction targets			Ban (of SUP items)	Best practices for WWTW
							25% by 2030	30% by 2025 50% by 2030	50% by 2025 80% by 2030		
Cigarette filters	a/b/c/d	a/b/c/d	d	b/c/d				d			
Drinks bottles	a/b/c/d	a/b/c/d		b/c/d	b/c/d	d					
Cotton bud sticks	a	a	a							b/c/d	
Crisp packets	a/b/c/d	a/b/c/d		b/c/d							
Wet wipes	a/b/c/d	a/b/c/d	a/b/c/d	b/c/d				c/d			d
Sanitary towels	a/b/c/d	a/b/c/d	a/b/c/d	b/c/d			d				
Cutlery	a/b	a/b		b				b		c/d	
Straws	a/b	a/b		b				b		c/d	
Stirrers	a/b	a/b		b				b		c/d	
Drinks cups & lids	a/b/c/d	a/b/c/d		b/c/d				b/c	d		
Food containers	a/b/c/d	a/b/c/d		b/c/d				b/c	d		
Balloons	a/b/c/d	a/b/c/d	a/b/c/d	b/c/d							
Balloon sticks	a/b/c/d	a/b/c/d	a/b/c/d	b						c/d	

Notes:

- The colour coding is as follows: Feasible (technically) = Green; Not feasible = Grey.
- Labels refer to which sub-option the measures are in. For example, for cigarette filters information campaigns are part of sub-options 2a, 2b, 2c and 2d whilst EPR for the cost of litter is not in option 2a but is in sub-options 2b, 2c and 2d. A reduction target for cigarette filters is part of option 2d, but it would be up to the Member State how this was met (with, for example, nudging policies used)
- Balloons and balloon sticks appear in the table, but were not explicitly modelled in the main assessment.

2.4 Model outputs

Table 25: Option 2 Model Outputs (2030) – Sub option 2a

Item	Measure	Reduction in marine plastics, kt	Reduction in marine plastics, million items	Marine litter reduction - % of SUP by weight*	Marine litter reduction - % of SUP by count*	Change in GHGs, million tonnes	Change in external costs (litter), € million	Change in external costs (LCA), € million	Change in external costs (total), € million	Change in manufacturing related land use, km2	Change in material demand, kt
Cigarette filters	Info. campaign + voluntary action	-0.01	-692.77	-0.1%	-10.1%	0.00	-€ 18	€ 0.001	-€ 18	0.00	0
Drinks bottles	Info. campaign + voluntary action	-1.58	-42.85	-10.6%	-0.6%	-0.92	-€ 3,394	-€ 96	-€ 3,490	-2.97	-34.88
Cotton buds	Info. campaign + voluntary action + labelling	-0.00	-11.90	0.0%	-0.2%	-0.00	-€ 33	€ 0.01	-€ 33	-0.00	-0.01
Crisp packets and sweet wrappers	Info. campaign + voluntary action	-0.06	-10.76	-0.4%	-0.2%	-0.00	-€ 129	-€ 0.004	-€ 129	0.00	0
Wet wipes	Info. campaign + voluntary action + labelling	-0.13	-114.16	-0.8%	-1.7%	-0.00	-€ 655	-€ 1.7	-€ 657	13.25	2.55
Sanitary towels	Info. campaign + voluntary action + labelling	-0.19	-30.36	-1.3%	-0.4%	-0.01	-€ 967	-€ 1.1	-€ 968	-0.03	-3.87
Cutlery	Info. campaign + voluntary action	-0.01	-4.94	-0.1%	-0.1%	-0.06	-€ 31	€ 0.5	-€ 30	-0.13	-19.71
Straws	Info. campaign + voluntary action	-0.04	-101.51	-0.3%	-1.5%	-0.05	-€ 99	-€ 5	-€ 104	0.04	-14.89
Stirrers	Info. campaign + voluntary action	-0.00	-5.43	0.0%	-0.1%	-0.11	-€ 6	-€ 2.8	-€ 9	-0.21	17.97
Drinks cups and lids	Info. campaign + voluntary action	-0.38	-27.33	-2.6%	-0.4%	-0.03	-€ 875	-€ 8	-€ 883	-0.73	-20.07
Food containers	Info. campaign + voluntary action	-0.35	-17.51	-2.4%	-0.3%	-0.10	-€ 908	€ 1.6	-€ 907	3.27	-24.39

*% reductions are calculated relative to the total marine litter of these 'top ten' items only.

Item	Measure	Change in consumer costs, € million	Change in retailer turnover, € million	Change in producer turnover (SUP), € million	Change in producer turnover (SUNP), € million	Change in producer turnover (MU), € million	Business compliance costs, € million	Information costs, € million	Commercial washing and refill scheme costs, € million	Change in waste management costs, € million	Change in employment, Thousand FTEs
Cigarette filters	Info. campaign + voluntary action	€ -	€ -	€ -	€ -	€ -	€ -	€ 102	€ -	€ 0.001	0.0
Drinks bottles	Info. campaign + voluntary action	-€ 2,800	-€ 2,800	-€ 1,573	€ 167	€ 6	€ -	€ 102	€ -	€ 5	-7.1
Cotton buds	Info. campaign + voluntary action + labelling	€ 0.0	€ 0.0	-€ 1	€ 1	€ 0.024	€ -	€ 16	€ -	-€ 0.47	0.004
Crisp packets and sweet wrappers	Info. campaign + voluntary action	€ -	€ -	€ -	€ -	€ -	€ -	€ 102	€ -	€ 0.01	0.0001
Wet wipes	Info. campaign + voluntary action + labelling	-€ 8	-€ 8	-€ 41	€ 37	€ 0.06	€ -	€ 58	€ -	€ 2.50	-0.041
Sanitary towels	Info. campaign + voluntary action + labelling	-€ 185	-€ 192	-€ 100	€ -	€ 4	€ -	€ 28	€ -	-€ 0.27	-1.1
Cutlery	Info. campaign + voluntary action	-€ 49	-€ 49	-€ 414	€ 389	€ 0.35	€ -	€ 14	€ 26	-€ 0.60	0.69
Straws	Info. campaign + voluntary action	-€ 146	-€ 146	-€ 292	€ 215	€ 3.4	€ -	€ 42	€ -	-€ 0.71	0.04
Stirrers	Info. campaign + voluntary action	-€ 512	-€ 512	-€ 346	€ 89	€ 0.46	€ -	€ 46	€ 88	€ 1.09	-1.2
Drinks cups and lids	Info. campaign + voluntary action	-€ 127	-€ 127	-€ 73	€ -	€ 10	€ -	€ 102	€ 15	-€ 0.54	-0.5
Food containers	Info. campaign + voluntary action	€ 144	€ 144	-€ 291	€ 354	€ 9	€ -	€ 102	€ 209	€ 25	5.3

Table 26: Option 2 Model Outputs (2030) – Sub option 2b

Item	Measure	Reduction in marine plastics, kt	Reduction in marine plastics, million items	Marine litter reduction - % of SUP by weight*	Marine litter reduction - % of SUP by count*	Change in GHGs, million tonnes	Change in external costs (litter), € million	Change in external costs (LCA), € million	Change in external costs (total), € million	Change in manufacturing related land use, km2	Change in material demand, kt
Cigarette filters	EPR – full cost of litter	-0.03	-2,627.74	-0.2%	-38.4%	0.00	-€ 25	€ 0.003	-€ 25	0.00	0
Drinks bottles	EPR – full cost of litter + Specific design requirements	-1.07	-29.19	-7.2%	-0.4%	0.08	-€ 2,089	€ 44	-€ 2,046	1.78	63.73
Cotton buds	Ban (of SUP items)	-0.01	-59.66	-0.1%	-0.9%	-0.00	-€ 61	€ 0.88	-€ 60	-0.08	-0.26
Crisp packets and sweet wrappers	EPR – full cost of litter	-0.23	-40.80	-1.5%	-0.6%	-0.00	-€ 177	-€ 0.01	-€ 177	0.00	0.00
Wet wipes	EPR – full cost of litter	-0.13	-114.16	-0.8%	-1.7%	0.00	-€ 532	€ 0.006	-€ 532	0.00	0.00
Sanitary towels	EPR – full cost of litter	-0.23	-37.31	-1.6%	-0.5%	0.00	-€ 840	€ 0.02	-€ 840	0.00	0.00
Cutlery	EPR – full cost of litter + Reduction targets (SUP)	-0.04	-13.91	-0.2%	-0.2%	-0.26	-€ 70	-€ 2.3	-€ 73	-0.44	-65.69
Straws	EPR – full cost of litter + Reduction targets (SUP)	-0.13	-329.71	-0.9%	-4.8%	-0.35	-€ 332	-€ 33	-€ 365	-0.51	-87.22
Stirrers	EPR – full cost of litter + Reduction targets (SUP)	-0.01	-17.63	-0.1%	-0.3%	-0.56	-€ 24	-€ 43	-€ 67	-1.29	-72.49
Drinks cups and lids	EPR – full cost of litter + Reduction targets (SUP)	-1.58	-112.83	-10.6%	-1.7%	-0.60	-€ 3,352	-€ 99	-€ 3,452	-7.31	-200.74
Food containers	EPR – full cost of litter + Reduction targets (SUP)	-0.99	-49.65	-6.7%	-0.7%	-0.33	-€ 1,976	€ 5	-€ 1,971	10.91	-81.31

*% reductions are calculated relative to the total marine litter of these ‘top ten’ items only.

Item	Measure	Change in consumer costs, € million	Change in retailer turnover, € million	Change in producer turnover (SUP), € million	Change in producer turnover (SUNP), € million	Change in producer turnover (MU), € million	Business compliance costs, € million	Information costs, € million	Commercial washing and refill scheme costs, € million	Change in waste management costs, € million	Change in employment, Thousand FTEs
Cigarette filters	EPR – full cost of litter	€ -	€ -	€ -	€ -	€ -	€ -	€ 102	€ -	€ 4	0.0
Drinks bottles	EPR – full cost of litter + Specific design requirements	€ 1,258	€ 1,258	€ 629	€ -	€ -	€ -	€ 102	€ -	€ 535	2.3
Cotton buds	Ban (of SUP items)	€ 0	€ 0	-€ 29	€ 29	€ 0.5	€ -	€ -	€ -	€ 0.4	0.1
Crisp packets and sweet wrappers	EPR – full cost of litter	€ -	€ -	€ -	€ -	€ -	€ -	€ 102	€ -	€ 30	0.0
Wet wipes	EPR – full cost of litter	€ -	€ -	€ -	€ -	€ -	€ -	€ 58	€ -	-€ 36.7	0.0
Sanitary towels	EPR – full cost of litter	€ -	€ -	€ -	€ -	€ -	€ -	€ 28	€ -	-€ 67.7	0.0
Cutlery	EPR – full cost of litter + Reduction targets (SUP)	-€ 197	-€ 197	-€ 1,360	€ 1,260	€ 1.2	€ -	€ 14	€ 87	-€ 4.1	2.4
Straws	EPR – full cost of litter + Reduction targets (SUP)	-€ 2,188	-€ 2,188	-€ 1,458	€ 359	€ 6	€ -	€ 42	€ -	-€ 13	-5.7
Stirrers	EPR – full cost of litter + Reduction targets (SUP)	-€ 3,159	-€ 3,159	-€ 1,730	€ 149	€ 0.8	€ -	€ 46	€ 147	-€ 6	-9.1
Drinks cups and lids	EPR – full cost of litter + Reduction targets (SUP)	-€ 1,265	-€ 1,265	-€ 728	€ -	€ 95	€ -	€ 102	€ 150	-€ 24	-4.0
Food containers	EPR – full cost of litter + Reduction targets (SUP)	€ 480	€ 480	-€ 970	€ 1,179	€ 30	€ -	€ 102	€ 697	€ 26	17.8

Table 27: Option 2 Model Outputs (2030) – Sub option 2c

Item	Measure	Reduction in marine plastics, kt	Reduction in marine plastics, million items	Marine litter reduction - % of SUP by weight*	Marine litter reduction - % of SUP by count*	Change in GHGs, million tonnes	Change in external costs (litter), € million	Change in external costs (LCA), € million	Change in external costs (total), € million	Change in manufacturing related land use, km2	Change in material demand, kt
Cigarette filters	EPR – full cost of litter	-0.03	-2,627.74	-0.2%	-38.4%	0.00	-€ 25	€ 0.003	-€ 25	0.00	0
Drinks bottles	EPR – full cost of litter + Specific design requirements	-1.07	-29.19	-7.2%	-0.4%	0.08	-€ 2,089	€ 44	-€ 2,046	1.78	63.73
Cotton buds	Ban (of SUP items)	-0.01	-59.66	-0.1%	-0.9%	-0.00	-€ 61	€ 0.9	-€ 60	-0.08	-0.26
Crisp packets and sweet wrappers	EPR – full cost of litter	-0.23	-40.80	-1.5%	-0.6%	-0.00	-€ 177	-€ 0.01	-€ 177	0.00	0
Wet wipes	Reduction targets (SUP)	-0.50	-450.72	-3.3%	-6.6%	-0.03	-€ 1,873	-€ 17	-€ 1,890	132.51	25.51
Sanitary towels	EPR – full cost of litter	-0.23	-37.31	-1.6%	-0.5%	0.00	-€ 840	€ 0.02	-€ 840	0.00	0
Cutlery	Ban (of SUP items)	-0.05	-17.94	-0.3%	-0.3%	-0.56	-€ 117	-€ 7	-€ 125	-0.88	-131.39
Straws	Ban (of SUP items)	-0.15	-371.50	-1.0%	-5.4%	-0.47	-€ 417	-€ 43	-€ 460	-0.44	-112.04
Stirrers	Ban (of SUP items)	-0.01	-19.87	-0.1%	-0.3%	-0.72	-€ 28	-€ 46	-€ 73	-1.64	-42.54
Drinks cups and lids	EPR – full cost of litter + Reduction targets (SUP) - high	-1.58	-112.83	-10.6%	-1.7%	-0.60	-€ 3,352	-€ 99	-€ 3,452	-7.31	-200.74
Food containers	EPR – full cost of litter + Reduction targets (SUP) - high	-0.99	-49.65	-6.7%	-0.7%	-0.33	-€ 1,976	€ 5	-€ 1,971	10.91	-81.31

*% reductions are calculated relative to the total marine litter of these 'top ten' items only.

Item	Measure	Change in consumer costs, € million	Change in retailer turnover, € million	Change in producer turnover (SUP), € million	Change in producer turnover (SUNP), € million	Change in producer turnover (MU), € million	Business compliance costs, € million	Information costs, € million	Commercial washing and refill scheme costs, € million	Change in waste management costs, € million	Change in employment, Thousand FTEs
Cigarette filters	EPR – full cost of litter	€ -	€ -	€ -	€ -	€ -	€ -	€ 102	€ -	€ 4	0.0
Drinks bottles	EPR – full cost of litter + Specific design requirements	€ 1,258	€ 1,258	€ 629	€ -	€ -	€ -	€ 102	€ -	€ 535	2.3
Cotton buds	Ban (of SUP items)	€ 0	€ 0	-€ 29	€ 29	€ 0.5	€ -	€ -	€ -	€ 0.4	0.1
Crisp packets and sweet wrappers	EPR – full cost of litter	€ -	€ -	€ -	€ -	€ -	€ -	€ 102	€ -	€ 30	0.0
Wet wipes	Reduction targets (SUP)	-€ 79	-€ 79	-€ 408	€ 368	€ 0.6	€ 36	€ 58	€ -	€ 25	-0.4
Sanitary towels	EPR – full cost of litter	€ -	€ -	€ -	€ -	€ -	€ -	€ 28	€ -	-€ 67.7	0.0
Cutlery	Ban (of SUP items)	-€ 409	-€ 409	-€ 2,712	€ 2,505	€ 2.3	€ -	€ -	€ 174	-€ 8	4.9
Straws	Ban (of SUP items)	-€ 2,431	-€ 2,431	-€ 1,944	€ 718	€ 11	€ -	€ -	€ -	-€ 8	-5.5
Stirrers	Ban (of SUP items)	-€ 4,012	-€ 4,012	-€ 2,306	€ 298	€ 1.5	€ -	€ -	€ 294	-€ 2.1	-11.2
Drinks cups and lids	EPR – full cost of litter + Reduction targets (SUP)	-€ 1,265	-€ 1,265	-€ 728	€ -	€ 95	€ 16	€ 102	€ 150	-€ 24	-4.0
Food containers	EPR – full cost of litter + Reduction targets (SUP)	€ 480	€ 480	-€ 970	€ 1,179	€ 30	€ 18	€ 102	€ 697	€ 26	17.8

Table 28: Option 2 Model Outputs (2030) – Sub option 2d

Item	Measure	Reduction in marine plastics, kt	Reduction in marine plastics, million items	Marine litter reduction - % of SUP by weight*	Marine litter reduction - % of SUP by count*	Change in GHGs, million tonnes	Change in external costs (litter), € million	Change in external costs (LCA), € million	Change in external costs (total), € million	Change in manufacturing related land use, km2	Change in material demand, kt
Cigarette filters	Reduction targets (SUP) + labelling	-0.04	-3,702.73	-0.3%	-54.2%	-0.03	-€ 80	-€ 3.4	-€ 83	24.38	0
Drinks bottles	DRS for beverage containers	-7.55	-205.40	-50.8%	-3.0%	-0.59	-€ 19,578	-€ 33	-€ 19,611	0.00	0
Cotton buds	Ban (of SUP items)	-0.01	-59.66	-0.1%	-0.9%	-0.004	-€ 61	€ 0.9	-€ 60	-0.08	-0.26
Crisp packets and sweet wrappers	EPR – full cost of litter	-0.23	-40.80	-1.5%	-0.6%	-0.0004	-€ 177	-€ 0.014	-€ 177	0.00	0.00
Wet wipes	Standards for WWTW	-0.43	-393.64	-2.9%	-5.8%	0.0004	-€ 122	€ 0	-€ 122	0.00	0.00
Sanitary towels	Reduction targets (SUP)	-0.57	-92.31	-3.8%	-1.4%	-0.10	-€ 2,679	-€ 14	-€ 2,693	-0.41	-48.42
Cutlery	Ban (of SUP items)	-0.05	-17.94	-0.3%	-0.3%	-0.56	-€ 117	-€ 7	-€ 125	-0.88	-131.39
Straws	Ban (of SUP items)	-0.15	-371.50	-1.0%	-5.4%	-0.47	-€ 417	-€ 43	-€ 460	-0.44	-112.04
Stirrers	Ban (of SUP items)	-0.012	-19.867	-0.08%	-0.29%	-0.72	-€ 28	-€ 46	-€ 73	-1.64	-42.54
Drinks cups and lids	Reduction targets (SUP) - high	-1.85	-132.48	-12.5%	-1.9%	-0.97	-€ 4,862	-€ 160	-€ 5,022	-11.69	-321.19
Food containers	Reduction targets (SUP) - high	-1.17	-58.30	-7.8%	-0.9%	-0.52	-€ 2,747	€ 8	-€ 2,739	17.45	-130.09

*% reductions are calculated relative to the total marine litter of these 'top ten' items only.

Item	Measure	Change in consumer costs, € million	Change in retailer turnover, € million	Change in producer turnover (SUP), € million	Change in producer turnover (SUNP), € million	Change in producer turnover (MU), € million	Business compliance costs, € million	Information costs, € million	Commercial washing and refill scheme costs, € million	Change in waste management costs, € million	Change in employment, Thousand FTEs
Cigarette filters	Reduction targets (SUP) + labelling	€ 381	€ 381	-€ 718	€ 908	€ -	€ 216	€ 102	€ -	€ 0.9	3.4
Drinks bottles	DRS for beverage containers	€ -	€ -	€ -	€ -	€ -	€ -	€ 102	€ -	€ 1,418	4.2
Cotton buds	Ban (of SUP items)	€ 0.4	€ 0.4	-€ 29	€ 29	€ 0.5	€ -	€ -	€ -	€ 0.4	0.1
Crisp packets and sweet wrappers	EPR – cost of litter	€ -	€ -	€ -	€ -	€ -	€ -	€ 102	€ -	€ 30	0.0
Wet wipes	Standards for WWTW	€ -	€ -	€ -	€ -	€ -	€ -	€ 58	€ -	€ 7,733	0.0
Sanitary towels	Reduction targets (SUP)	-€ 2,316	-€ 2,396	-€ 1,254	€ -	€ 55	€ 26	€ 28	€ -	-€ 3.7	-13.2
Cutlery	Ban (of SUP items)	-€ 409	-€ 409	-€ 2,712	€ 2,505	€ 2.3	€ -	€ -	€ 174	-€ 8	4.9
Straws	Ban (of SUP items)	-€ 2,431	-€ 2,431	-€ 1,944	€ 718	€ 11	€ -	€ -	€ -	-€ 8	-5.5
Stirrers	Ban (of SUP items)	-€ 4,012	-€ 4,012	-€ 2,306	€ 298	€ 1.5	€ -	€ -	€ 294	-€ 2.1	-11.2
Drinks cups and lids	Reduction targets (SUP) - high	-€ 2,025	-€ 2,025	-€ 1,165	€ -	€ 152	€ 16	€ 102	€ 239	-€ 23	-6.3
Food containers	Reduction targets (SUP) - high	€ 769	€ 769	-€ 1,551	€ 1,887	€ 49	€ 18	€ 102	€ 1,115	€ 38	28.5

ANNEX 7. ABANDONED, LOST AND OTHERWISE DISCARDED FISHING GEAR: ASSUMPTIONS AND ANALYSIS

The numbers presented here are those used in our analysis. They are not rounded but it should be understood that they are estimates.

1 ANNUAL PURCHASES OF GEAR[42]

	13941233 - Made-up fishing nets from twine, cordage or rope of man-made fibres (excluding fish landing nets) for EU28		**13941235 - Made-up fishing nets from yarn of man-made fibres (excluding fish landing nets) for EU28**	
	mass (kg)	value	mass (kg)	value
Exports	4,321,300	€31,180,750	3,785,200	€24,991,800
Imports	6,985,000	€15,639,950	2,680,900	€17,180,900
Production	19,800,000	€113,440,000	5,554,392	€38,255,070
Consumption	22,463,700	€97,899,200	4,450,092	€30,444,170

This gives a total of 26,913,792 kg, worth €128,343,370.

Surveys of litter suggest that netting makes up 14% (Marcus Eriksen, 2014) and 39% (Legambiete) of litter from fishing and aquaculture whereas measurements of the great garbage patch (L. Lebreton, 2018) indicate that 46% of all waste is fishing nets.

For the purposes of this analysis, we assume that fishing nets make up half the mass of all plastic from fisheries and aquaculture and that the cost per tonne of other gear (buoys, traps, pots etc) is the same as for nets.

Thus we estimate that the EU fishing fleet consumes annually 53,827,584kg of fishing gear (nets and other gear) for a total cost of €256,686,740.

2 ANNUAL LOSSES OF GEAR

Iceland has put in place a systematic approach for collecting lost and end-of-life gear paid through their recycling fund. Even with this well-honed approach, losses are 10% and presumably lost at sea. No EU country has such an approach.

There have been a number of estimates of what is lost by EU vessels (Vincent Viool, 2018) On this basis weassume that the average for the EU28 is 20%. This results in an annual loss of gear of 10,766 tonnes.

[42] Eurostat PRODCOM database

3 EFFECTIVENESS OF FISHING FOR LITTER

Fishing for litter can be divided in two types

- Active, where vessels make special trips to pick up litter
- Passive, where vessels bring litter ashore that they pick up in nets

3.1 Active

For active fishing for litter, a recent study (ICF Consulting Services Limited , 2018) indicated a cost of €818-1,275 per tonne of net retrieved. This may be on the low side because the lower figure is from an annual Norwegian effort which has accumulated experience during annual trips to well-defined areas.

Nevertheless, for our analysis we take €1000 per tonne.

3.2 Passive

Passive fishing for litter involves vessels bringing to shore litter that they find in their nets. This is largely from the sea bottom. Pelagic vessels (ie. those fishing in the water column) pick up very little. OSPAR have analysed the performance of a number of fleets.

	UK	Netherland	Sweden	Germany	EU average (estimate)
Vessels	474	91	33	60	
Tonnes per vessel annum	0.3	3.13	14.88	0.02	0.69
Cost per vessel per annum	€49	€495			€121

Assuming that half the litter is plastic from fishing, we arrive at a cost of €350 per tonne.

4 EFFECTIVENESS OF MEASURES

4.1 European Maritime and Fisheries Fund

Member State authorities have allocated €7,750,000 per year for measures to remove marine litter. While the operational programmes do not contain a precise enough breakdown, using the breakdown of the predecessor 2008-2014 European fisheries Fund and the removal costs for active and passive fishing we can estimate the impact:

	proportion	annual cost to public budget	annual plastic removal (tonnes)
Collection of lost fishing gear / 'fishing for litter'	46%	€ 3,500,000	3,500
Litter collectors/bags on board and in port (renting and transport, purchase)	25%	€ 2,000,000	5,670
Treatment/processing of litter	17%	€ 1,300,000	
Awareness raising among fishers	5%	€ 400,000	
Research related to marine litter	5%	€ 400,000	
Recovering/recycling of plastics	2%	€ 150,000	
total	100%	€ 7,750,000	

This measure is dealing with gear lost over previous years. It will reduce the amount of gear in the sea but not prevent further losses.

4.2 Port Reception Facilities Directive

Number of vessels (EU active large scale fleet)	**16,146**	**vessels**
Tonnes per year brought ashore (all material) assuming half the vessels in the fleet participate and 0.69 tonnes/vessel	5,531	tonnes
Tonnes per year saved (fishing gear assumed to be half the plastic)	2,766	tonnes

The revision of the Port Reception Facility will remove financial penalties for vessels that bring their litter back to shore. Assuming that half the large scale vessels of the EU fleet participate, then the revision will result in 2,766 *more* tonnes of fishing gear will be brought back to shore.

4.3 Extended Producer Responsibility

Under Extended Producer Responsibility, plastic litter delivered to ports would be properly separated, processed and transported to appropriate facilities where it would be burnt, recycled or placed in landfill. Taking as a basis a national system that uses a similar approach, Iceland has put in place a system for collecting lost and end-of-life gear paid through their recycling fund. With this approach, losses/discards at sea can be reduced to 10% of gear. No EU country has such an approach. This is indicative of the potential reduction achievable.

This would bring all EU countries almost up to the standard of Iceland which manages to deal with 90% of fishing gear in this way.

Part of the contribution to reduction of losses/discards will come from the revision of the Port Reception Facilities Directive. The additional benefit will be 2,617 tonnes of plastic fishing gear not dumped in the sea.

	tonnes of plastic gear
Residual losses 10%	**5,383**
Rotal gain compared to baseline	**5,383**
Gain due to EPR (subtract contribution from Port Reception Facilities Directive	**2,617**

4.4 Extended Producer Responsibility with return of deposit

This would have a similar benefit to the buy back scheme whereby the Korean Government (Ministry of Maritime Affairs and Fisheries - MOMAF), purchases waste fishing gear returned to port by fishers. This is reported to be "*highly effective in terms of recovery and disposal of gear*" (Graham Macfadyen, 2009)and goes beyond the Icelandic system.

This would reduce the loss of gear to the truly unavoidable 5%.

	tonnes of plastic gear
Further reduction due to deposit	2,691
Inflow after measures	2,691
Mass of fishing gear reaching proper waste management following implementation of Port Reception Facilities Directive and Extended Producer Responsibility with a deposit	95%

The contribution from this measure would be 2,691 tonnes of plastic fishing gear.

5 COSTS

5.1 Overall costs

The costs can be divided between operations (collecting material at ports, sorting it, transporting it and processing it) and administration (monitoring, financing, reporting).

The operational costs were based on costs of the Icelandic Recycling Fund. The administrative costs are based on estimates in a study performed in the framework of this impact assessment (Vincent Viool, 2018)

Operational costs	
Cost per tonne of transport, processing, recycling/incineration/landfill	€200
Tonnes to be treated for EPR production (assumes 10% is lost at sea)	48,445
Operational cost for EPR	€ 9,688,965
Tonnes to be treated for EPR+deposit (assumes 5% lost at sea)	51,136
Extra cost for EPR+deposit	€ 538,276
Administration costs	
EPR operational	€ 1,300,000
EPR set-up	€ 6,360,000
EPR with deposit set-up	€ 19,000,000
EPR with deposit operational	€ 3,900,000

5.2 Impact on fishermen

Cost	
As percentage of gear costs	5.3%
As proportion of revenue	0.20%

5.3 Environmental benefits

Estimates of damage to fishing range from 1% (Mike Van Acoleyen, 2013) to 5% (Bergmann, 2015) of revenue. The cost to tourism is estimated as being between 50,000 kilometres of EU coastline amounted between approximately €194 and 630 million (Mike Van Acoleyen, 2013). And costs to ports are estimated at €30 million each year in this impact assessment.

If we suppose that the amount of litter in the sea amounts to 10 years worth of 15.000 tonnes from land and 10,650 from the sea, then the benefit of removing 1,000 tonnes of litter can be estimated as:

	Lower limit		Upper limit	
	impact	benefit of removing 1000 tonnes	impact	benefit of removing 1000 tonnes
Fishing	€60,000,000	€232,869	€300,000,000	€1,164,347
Ports	€30,000,000	€116,435	€30,000,000	€116,435
Beaches	€194,000,000	€752,944	€630,000,000	€2,445,129
Total	€284,000,000	€1,102,248	€960,000,000	€3,725,910

Bibliography

ICF Consulting Services Limited . (2018). *Plastics: Reuse, recycling and marine litter.* Third Interim report.

Bergmann, M. G. (2015). *Marine Anthropogenic Litter.* Springer.

Graham Macfadyen, T. H. (2009). *Abandoned, lost or otherwise discarded fishing gear.* UNEP Regional Seas Reports and Studies, FAO Fisheries and Aquanculture Technical Paper.

L. Lebreton, B. S.-R.-A. (2018). Evidence that the Great Pacific Garbage Patch is rapidly accumulating plastic. *Scientific Reports, 8*.

Legambiete. (n.d.). *Beach Litter 2016: I dati dell'indagine di Legambiente sui rifiuti nelle spiagge italiane nell'ambito di Spiagge e Fondali puliti – Clean up the Med*. Retrieved from https://www.legambiente.it/contenuti/comunicati/beach-litter-2016-i-dati-dell-indagine-di-legambiente-sui-rifiuti-nelle-spiagge

Marcus Eriksen, L. C. (2014, December 10). Plastic Pollution in the World's Oceans: More than 5 Trillion Plastic Pieces Weighing over 250,000 Tons Afloat at Sea. *PLoS ONE 9(12): e111913.*

Mike Van Acoleyen, I. L. (2013). *Marine Litter study to support the establishment of an initial quantitative headline reduction target.* Contract commitment nr SI2.662992 under FWC ENV.

Vincent Viool, S. O. (2018). *Study to support impact assessment for options to reduce the level of ALDFG.* Final Report.

ANNEX 8: WHO IS AFFECTED AND HOW?

1 PRACTICAL IMPLICATIONS OF THE INITIATIVE

The preferred option would reduce SUP marine litter by half and reduce litter from fishing and aquaculture entering the sea by a quarter over and above measures already planned. It includes:

- ban of single use plastic versions of cotton bud sticks, plastic balloon sticks cutlery, straws and stirrers;
- reduction targets for single use plastic versions of drinks cups and lids, wet wipes, and food containers: 30% by 2025 and 50% by 2030;
- EPR to contribute to the cost of prevention and cleaning up litter from cigarette filters, drinks bottles, crisp packets and sweet wrappers, wet wipes, sanitary towels, drinks cups and lids, food containers, balloons.
- product design measures for drink bottles related to tethered caps;
- EPR on fishing gear containing plastic to cover cost of monitoring and collection of damaged or end-of-life gear at ports, transport to appropriate destination and final treatment or disposal.

In practical terms, the bans and reduction targets would induce a switch in consumption from single-use plastics either to multi-use alternatives or to single-use non-plastic alternatives. The alternatives for the different SUP items are described in detail in Annex 6. For the other items, information and awareness raising actions aim to reduce littering, and EPR to pay the cost of prevention and cleaning-up when litter still occurs. The specific case of tethered caps is meant to reduce significantly the littering of single caps and lids. For fishing gear, the actions would lead, together with other planned measures, to a reduction of losses of fishing gear at sea to the truly unavoidable.

These shifts in consumption patterns have their reflection in changes in retail patterns and further upstream in production. If a consumer can no longer buy a plastic cotton bud stick, then production (and retail) could shift, for example, to paper cotton bud sticks. In other cases, the shift will be more complex with for example a shift to reusable cups.

2 SUMMARY OF COSTS AND BENEFITS

I. Overview of Benefits (total for all provisions) – Preferred Option		
Description	***Amount***	***Comments***
Direct benefits		
Reduction in marine litter (tonnes) from SUP	4,850 tonnes per annum	
Reduction in marine litter (tonnes) from ALDFG	2,617 tonnes per annum	Over and above reductions due to planned initiatives for Port Reception Facilities, Fisheries Control Regulation and European Maritime and Fisheries Fund
Reduction in marine litter (by count) from SUP	Around 50% of total SUP (56% of Top 10 SUP)	
Reduction in GHG	2.63 million tonnes	
Benefit of cleaner seas to fisheries, ports and tourism	€10 million- 30 million per annum	For removal of 10,000 tonnes per annum Estimates vary within this range
Reduction in external costs	11.1 billion Euros	Not financial benefits, but estimated monetary equivalent associated with a range of environmental impacts but in particular disamenity associated with litter on land and in water
Savings for consumers	6.5 billion Euros	Net saving as reduced expenditure on single-use items and switch to multi-use. Estimate includes washing costs for consumers. Does not include any additional inconvenience.

(1) Estimates are relative to the baseline for the preferred option as a whole and provided for SUP and fishing gear separately;

II. Overview of costs – Preferred option						
	Citizens/Consumers		Businesses		Administrations	
	One-off	Recurrent	One-off	Recurrent	One-off	Recurrent
Cigarettes				€102 m pa - Information costs		€4m pa – waste management
Bottles				€102 m pa - Information cost		€535m pa – waste management
Cotton buds						€0.4m pa – waste management
Crisp packets and sweet wrappers				€102 m pa - Information costs		€30m pa – waste management
Wet wipes				€58 m pa - Information costs€36m pa – compliance costs		€25m pa – waste management
Sanitary towels						€25m pa – waste management
Cutlery				€174m pa – commercial washing and refill schemes		€8m pa reduction – waste management
Straws						€8m pa reduction – waste management
Stirrers				€294m pa – commercial washing and refill schemes		€2.1m pa reduction – waste management
Drinks cups and lids				€150m pa – commercial washing and refill schemes €102 m pa - Information costs €16m pa – compliance costs		€24m pa reduction – waste management
Food containers				€697m pa – commercial washing and refill schemes €102 m pa - Information costs €18m pa – compliance costs		€26m pa– waste management
Fishing Gear			€6.3m set-up costs	€9.7m collection, transport. processing €1.3m administration		

(1) *Estimates are compared to the baseline*