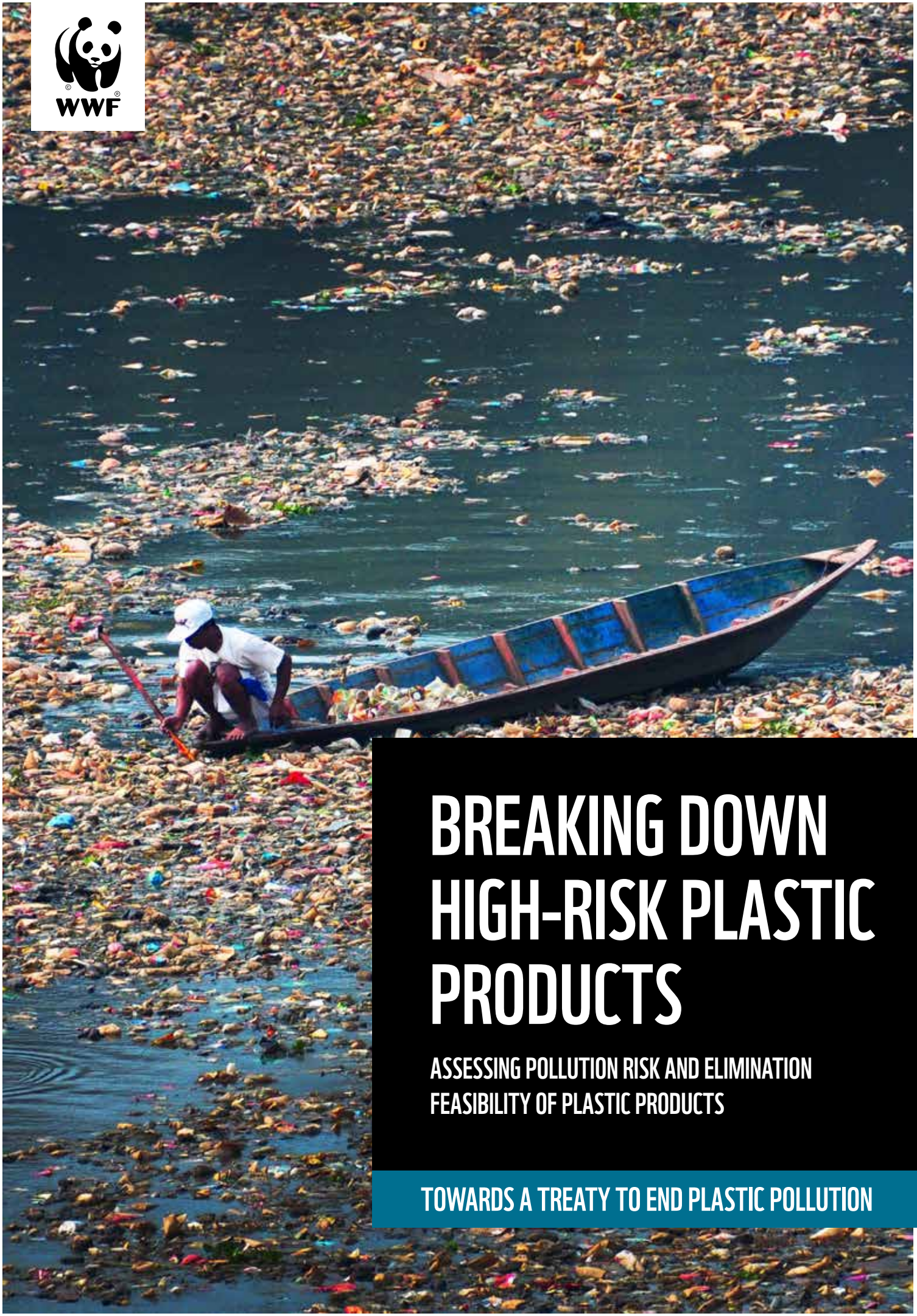

BREAKING DOWN HIGH-RISK PLASTIC PRODUCTS

ASSESSING POLLUTION RISK AND ELIMINATION FEASIBILITY OF PLASTIC PRODUCTS

TOWARDS A TREATY TO END PLASTIC POLLUTION

World Wide Fund for Nature (WWF)

One of the world's largest and most experienced independent conservation organizations, with over 5 million supporters and a global network active in more than 100 countries. WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature by conserving the world's biological diversity, ensuring the sustainable use of renewable natural resources, and promoting the reduction of pollution and wasteful consumption.

Eunomia Research and Consulting

Eunomia was founded in 2001 with the aim of working with clients to develop credible, intelligent solutions that support a more sustainable future. Over the past 20 years they have worked with hundreds of prominent public and private sector organisations in the UK, Europe, North America and beyond to make a positive impact. Their experienced consultants work in partnership with clients, offering a deeply personal service based on their specific requirements, seeking to create long-term partnerships which drive genuine change.

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EXECUTIVE SUMMARY

The UN Environment Assembly's decision, in March 2022, to start international negotiations on a plastic pollution treaty marked a watershed moment. Following a successful first session of the Intergovernmental Negotiation Committee (INC), states and other stakeholders are now committing to paper what the new treaty should contain. As states prepare for the INC's second session in Paris, France, the key questions are exactly what the new treaty should regulate — and how.

The significance of these questions cannot be overstated. Too often, efforts to negotiate multilateral environmental agreements have resulted in little more than vague statements of intent. To shape the new treaty on plastic pollution into an effective instrument of international law, states and other stakeholders will have to identify, adopt, and implement a set of specific control measures targeting the most important drivers of such pollution.

The objective of this research — commissioned by WWF and conducted by Eunomia — is to identify and prioritize plastic product groups with the highest pollution risk, and the control measures that would be most suitable to address them. This research thus aims to provide a deep dive into one core component of the treaty.

This research contributes with the following assessments:

- Plastic products are placed in groups based on their properties, uses and pathways to the environment, and assessed against criteria of pollution probability and impacts.
- The prioritized high-risk product groups are classified into Class I and Class II, based on an assessment of the feasibility for elimination or reduction in the use of plastic products within each product group.
  - Class I contains product groups with High feasibility of elimination, or at least significant reduction in use, according to available evidence at the time of assessment.
  - Class II contains product groups that cannot be targeted for significant reduction or elimination at the time of assessment. Control measures will be needed to ensure and maximize the responsible circulation of these plastic products, and the plastic they contain, throughout the plastic chain, and responsible management when further safe and non-toxic circulation is not possible.
- A range of control measures, following the hierarchy of elimination, reduction, safe circulation and safe management, are assessed to identify those that are best suited to tackle different Class I and Class II product groups: preventing, reducing and controlling the direct or indirect introduction of these plastic products into the environment and the resultant harms.

The research results are presented in two reports. Report One, **'Breaking down high-risk plastic products'**, identifies high-level product groups — groups with distinct descriptions that can be used for the purpose of regulation, across the range of plastic products in circulation. Pollution risks and the feasibility of pursuing a significant reduction or elimination strategy by 2035 are assessed, based on current knowledge, to identify and finalize these product groups, and place them in either Class I or Class II. Report Two, **'Regulating high-risk plastic products',** identifies the potential control measures available for Class I and Class II objectives and considers the suitability of these approaches for each product group.

Together, the reports provide both:

- A framework for assessing the urgency, need and feasibility of control measures, and what those control measures could be; and
- An assessment, based on current evidence, of how product groups can be treated within that framework to guide negotiators.

FINDINGS AND RECOMMENDATIONS

Controls for specific product groups have the potential to be a core part of the global treaty to prevent plastic pollution. This study shows that it is not only feasible but also desirable to break the plastic pollution problem into specific categories for regulation, enabling the new treaty to establish the most effective regulatory approach for each category. The complex global problem of addressing plastic pollution can be overcome by systemically dividing and tackling specific plastic categories with global regulations.

The suitable regulatory approaches for different product groups, as assessed by the study, should be considered as core obligations and control measures in the treaty. They include bans and phase-outs, reduction targets, economic instruments, standards and requirements, extended producer responsibility schemes and deposit return schemes. The study's identification and prioritization of the product groups, meanwhile, provide early inputs to what the associated annexes of those measures should include.

As further evidence emerges in future, additional control measures may be warranted, focused on additional plastic product groups. Similarly, as new solutions emerge, the ability to act aggressively to eliminate, reduce, circulate or manage plastics may justify additional actions. The new treaty's ability to evolve by amending annexes and adding protocols could be crucial for the global community's long-term efforts to tackle plastic pollution.

Product controls will not be the only component of the treaty, and its overall impact will be determined by not simply the range and ambition of agreed measures, but how they fit together with each other and with other aspects of the treaty. Bans and phase-outs of certain types of polymers and additives, general obligations related to total plastic production and consumption, as well as supporting measures such as a strong financial mechanism, will be crucial complementary elements to product-specific controls.

KEY CONCLUSIONS OF REPORT ONE

- This report identifies 17 core product groups that share similar risk features and suitability for regulation. This approach proves to be the best way to think about the full range of plastic products that may be in scope for global controls and can be used to inform any annexes in the new treaty.
- The groups are kept broad to ensure coverage of products and reduce risk of loopholes. The product group approach still allows scope to additionally regulate specific products within groups, or further subdivide groups where this adds value.
- A risk-based analysis of these product groups shows that certain products are greater contributors to plastic pollution than others and must be the immediate priority for regulation.
- Product controls should follow a hierarchy that prioritizes elimination, then reduction, then safe circulation, and then safe management.
- A feasibility assessment showed that not all product groups identified as high priority in the risk-based analysis can currently be eliminated or significantly reduced without negative consequences.
- The product groups are placed in two classes, depending on the controls needed under the treaty:
  - Class I controls focus on elimination or significant reduction of product groups, or plastic within them: these cover certain single-use packaging, certain single-use items, and microplastics intentionally added to products.
  - Class II controls focus on safe circulation and safe management of product groups where elimination is not currently feasible. This may be because of significant risks of unintended environmental consequences (in particular the risk of substitution of equally or more damaging non-plastic alternatives), or because the technical or socioeconomic feasibility of eliminating these product groups is not yet proven. Further research identifying and demonstrating solutions could justify reassessment in these cases.
- The prioritization and assessment framework used here can be reapplied in future if the evidence relating to risks or feasibility for existing product groups changes, or if additional product groups are separated out for more detailed regulation.

Report Two identifies the product controls that are justified based on current knowledge and needed in the new treaty to end plastic pollution.


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DEFINITION OF KEY TERMS

Please note that the following definitions are specific to this research and its purposes, and do not follow the definitions contained in the UNEP Glossary of Terms for Negotiators of Multilateral Environmental Agreements.[1]

Category – a set of plastic product groups, sharing some common features and treated together for the purpose of analysis.

Class – a set of plastic product groups, with membership determined by whether reducing or eliminating their production, consumption and trade would result in significant negative consequences.

Compostable and biodegradable – there is no agreed definition for these terms, the requirements for such a definition are discussed in 'Reducing harm in the environment' under **Section 4.3** of **Report Two (Regulating high-risk plastic products)**

Disposal – this research uses the term 'disposal' to mean the landfilling and incineration of waste. This is distinct from the Basel Convention definition of disposal, which includes recovery operations, including recycling.

Environmentally sound waste management – as defined by the Basel Convention, waste management is environmentally sound when it takes all practicable steps to ensure that hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes.[2]

Essential use – a term used in other environmental treaties for uses that are necessary for the health, safety or are critical for the functioning of society (encompassing cultural and intellectual aspects); and there are no available technically and economically feasible alternatives or substitutes that are acceptable from the standpoint of environment and health.[3] This report frequently uses the term **'necessary'** as an alternative, see 'necessary product' as discussed below.

Microplastics –plastic particles less than 5 mm in diameter, including nano-sized particles.[4]

Necessary products - products that are currently important, or where substitution or plastics now might have unintended consequences, but where use of either the product, or of plastic within the product, could potentially already be reduced or could potentially be pursued longer term. These are more limited than those of 'essential use'.

Plastic pollution – details of how this term is defined for this research are in **Section 1.2.** In summary, it is defined firstly by the introduction of plastic into the environment and secondly by the negative effects resulting from this.

Pollutant – a substance or a group of substances that may be harmful to the environment or to human health on account of its properties and of its introduction into the environment.[5]

Plastic – plastic is a solid material which contains as an essential ingredient one or more high-molecular mass polymers, and which is formed (shaped) during either manufacture of the polymer or the fabrication into a finished product by heat and/or pressure. Plastics have material properties ranging from hard and brittle to soft and elastic[6]**.**

Plastic product – in this research, we see a plastic product as a type of item made from or containing plastic that is manufactured for sale or distribution, including plastic packaging and single-use items, as well as items designed to have longer use-phases.

High-risk plastic products – details of how this term is defined for this report are in **Section 1.2**. In summary, 'high-risk plastic products' are those product groups most likely to be directly or indirectly introduced into the environment, and to cause resultant negative effects.

Product group – a set of plastic products sharing intended functions, characteristics and patterns of use.

Recycled content – in this research, 'recycled plastic content' means post-consumer recycled (PCR) content, meaning plastic that has been recycled from plastic products placed on the market. This is distinct from post-industrial recycled (PIR) content, which is plastic that has been recycled from plastic waste arising during the plastic manufacturing process.

Safely managed – plastic products are considered to be safely managed at end-of-life when they are captured and treated by waste management systems in such a way that they are neither directly nor indirectly introduced into the environment, and that any potential negative effects resulting from their management are avoided. This definition aligns with the Basel Convention's definition of 'environmentally sound waste management',[7] but focuses more on preventing plastic products from being lost to the environment and generating plastic pollution.

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CHAPTER 1
INTRODUCTION

1.1. BACKGROUND AND OBJECTIVES

The intergovernmental negotiation to develop an international legally binding instrument to end plastic pollution, including in the marine environment (referred to as 'the treaty' for the rest of this report) is currently underway and expected to conclude by the end of 2024.

WWF aims to contribute to the growing body of research on the global solutions to plastic pollution[8] and provide evidence-based recommendations to support the development of an effective treaty. In November 2022, WWF published overarching recommendations for designing the treaty's core obligations:[9]

- The use of specific, binding global rules to solve the global plastic pollution problem.
- The use of **control measures across the plastic life cycle** to:
  - Eliminate and reduce the production of certain high-risk plastic categories
  - Ensure and maximize the effective, safe and non-toxic circulation of the plastics that are produced
  - Strengthen environmentally sound management of the plastics that end up as waste.
- Prioritization to address plastic types that constitute the largest portion of plastic pollution.

With the expected timeframe of finalizing the treaty's text by the end of 2024, it is imperative that the negotiation moves as soon as possible from the abstract to specifics. The objective of this current research – commissioned by WWF and conducted by Eunomia – is to identify the specific plastic products that most urgently require international interventions, and the most appropriate measures to tackle them. This was achieved through the assessment of firstly the pollution risks and then the feasibility for elimination of each product group.

The final treaty will potentially have other components among its key elements, such as provisions to reduce the production of primary plastic polymers of concern,[10] eliminate and restrict specific plastic polymers and chemicals,[11] and more. This analysis is meant to provide clear recommendations for one important element of the treaty, rather than to detract from those other elements. The treaty's goal to end plastic pollution will likely require several complementary approaches – this is one of them.

Indeed, many controls at product-group level will be more effective if also linked to control measures that target plastic materials more generally. Alongside the product-group controls identified and assessed through this research, detailed proposals for such measures should be developed to support the treaty negotiation.

The results of this research are presented in two connected reports:

- Report One, 'Breaking down high-risk plastic products', sets out a framework for identifying and prioritizing plastics products with high pollution risk. It then provides an assessment of their pollution risks, and feasibility for elimination and reduction, and classifies them in accordance with this assessment.
- Report Two, 'Regulating high-risk plastic products', identifies control measures that are suitable to tackle those plastic product groups identified as high risk in Report One.

Figure 1-1: Assessment of risk and feasibility

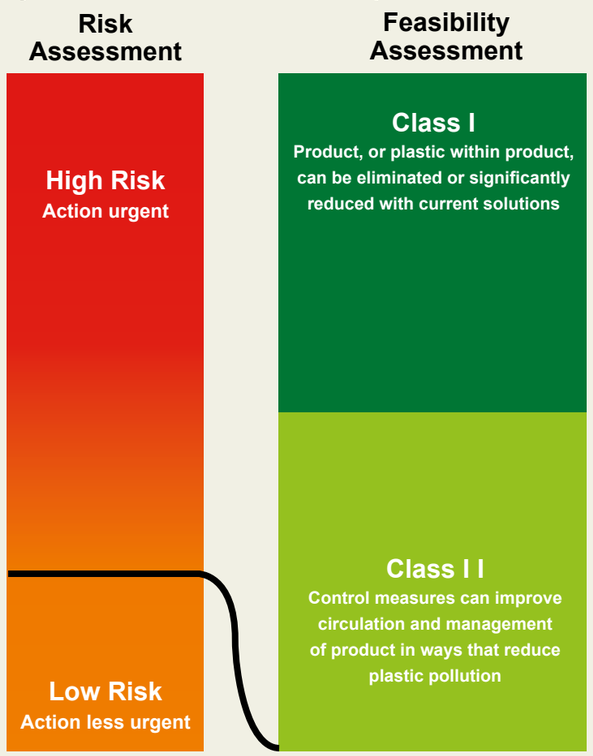
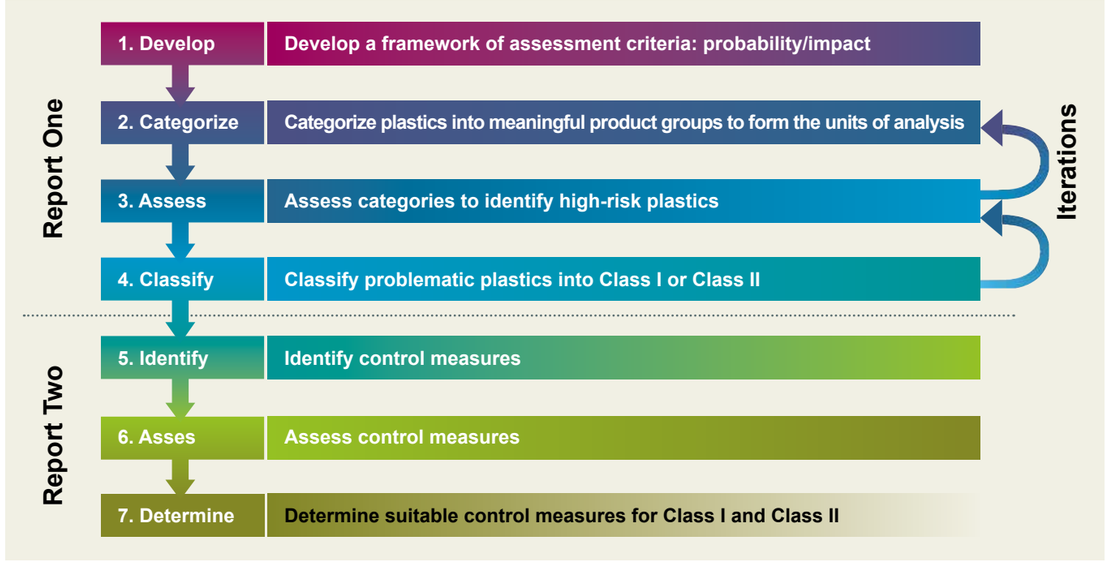


Figure 1-2: Diagram of the methodology



1.2. METHODOLOGY

To identify the plastic product groups with high pollution risks, and classify them as either Class I or Class II, the methodology shown in Figure 1-2 was adopted. Steps 1-4 are detailed further in this report, while steps 5-7 are discussed in Report Two.

1. **Develop:** A framework of pollution risk assessment criteria was developed to identify the most high-risk plastic product groups, based on two broad metrics: probability that the products enter the environment, and the impacts when products do enter the environment. See **Section 3.0** for more details.

2. **Categorize:** High-level categories of plastic products were identified, and then further split into subgroups as necessary, to reflect the performance of specific plastic products against the assessment criteria and based on their specific characteristics and use patterns. For example, from the high-level grouping of 'packaging', the subgroups of 'contact sensitive' and 'non contact sensitive' were subsequently defined, with 'contact sensitive' then further split into 'single-use food and beverage', 'multi-use food and beverage' and 'other'. This was an iterative process. See **Section 2.0** for more details.

3. **Assess:** The previously identified product groups were then assessed against the metrics described above, each broken down into a set of criteria. The product groups were assessed against these criteria using a 'traffic light' performance rating system (where red = high risk, amber = moderate, yellow = low). Product groups with the highest combined ratings in terms of both probability of entering the environment and impacts once in the environment were identified as high-risk plastic product groups. See **Section 3.0** for more details.

4. **Classify:** The resulting high-risk plastic product groups were then assessed to determine the feasibility of control measures to entirely eliminate or significantly reduce their use. This metric encompassed three criteria relating to technical feasibility, socioeconomic feasibility and the likelihood of unintended consequences, with feasibility of eliminating the product group assessed as either low, medium or high. Based on this, the product groups were further classified into Class I or Class II. See **Section 4.3** for more details.

The chosen focus and concepts applied in these reports — the defining factors of pollution, plastic product groups as the units of analysis, and prioritization based on risk — are explained below.

INTERPRETING THE TERM 'PLASTIC POLLUTION'

For the current research, two specific features of plastic pollution have been selected as key to assess the plastic products and the risk they pose:

1. The direct or indirect introduction of the pollutant into environmental mediums (i.e., water, air, soil, etc.)
1. The resultant deleterious effects, which could include harms to humans (including human health), other living species and the environment.

Multilateral environmental agreements that have defined the term 'pollution' or 'pollutant' have included these as two defining features for such terms. These agreements include Barcelona Convention (originally adopted in 1976, amended in 1995), Prevention and Emergency Protocol (1976, under Barcelona Convention), Kuwait Regional Convention (1978), Convention on Long-range Transboundary Air Pollution (1979), Jeddah Convention (1985), Noumea Convention (1990) and Kyiv Protocol on Pollutant Release and Transfer Registers (2003, under Aarhus Convention).

In line with the two key elements identified above, the focus of the current research is more focused on the physical release of plastics into the environment. In considering plastic pollution, both micro and macro plastics are included. In the assessment of risks and harms, the research also considers chemical properties that impact either of these two defining factors of pollution, alongside other specific harms associated with particular groups of plastic products.

This research consistently shows that even when the problem analysis zooms in on priority high-risk product groups, the causes are frequently similar across product groups. Systemic failures throughout the plastic life cycle (including design, production, distribution, use and end-of-life) are driving all aspects of plastic pollution. See Table 1-1 below.

Table 1-1: Process flow

PROCESSES	EXAMINATION OF THE SYMPTOMS	DIAGNOSIS OF THE ROOT CAUSES	PRESCRIPTION FOR PREVENTION AND TREATMENT
THE SUBJECT OF THE PROCESS	Plastic products most likely to cause plastic pollution	System failures across the plastic product life cycle	Solutions across groups of products to prevent, reduce and control plastic pollution
THE SPECIFICS OF ASSESSMENT	●Direct and indirect introduction into the environment, including the marine environment ●Direct and indirect introduction into the environment, including the marine environment ●The deleterious effects on human health and the environment, resulting from its introduction into the environment	●Prevalence and concentrations of plastics in certain product groups ●Pathways to the environment ●Patterns of production, consumption, management, and disposal ●Failures in product design, systems and practices that lead to pollution	●Interventions at key points to stop the system failures, taking into account waste hierarchy, life-cycle approach ●Efficiency, feasibility and co-benefits of interventions
OUTCOMES OF ASSESSMENT	●Plastic product groups that are most likely to end up in the environment ●Plastic product groups that present the greatest potential for deleterious effects on human health and the environment	●High-risk products' designs, properties, materials ●High-risk patterns of production, consumption, management and disposal ●Lack of product circularity (reusability, reparability recyclability, recycled content) ●Lack of systems to enable product circularity (reuse, collection and recycling systems) ●Lack of incentives for circular products and models/ disincentives for linear models ●Lack of controls over waste disposal routes (open landfills, dumping, burning of plastics)	●Prohibit/phase out the production, sale, distribution and use ●Disincentivize production and consumption ●Mandate requirements and standards for products and systems to increase collection, reuse and recycling ●Mandate requirements and standards for disclosure, transparency and traceability ●Mandate requirements and standards for environmentally sound waste management (landfill and incineration)

PLASTIC PRODUCTS AS UNITS OF ANALYSIS

This research developed **a product-based approach to categorize high-risk plastics.** This means that plastics are categorized into product groups, based on their intended functions, characteristics and patterns of use. The aim is to identify product groups that make sense to consider together – in terms of use, impacts and the suitability of control measures. The key rationale was that the function, characteristics and usage patterns of the products are what determine their likelihood of becoming plastic pollution. More details on the product groups can be found in **Chapter 2** and **the Appendix**.

A key advantage of the product-group approach is that it allows the treaty to tackle large groups of products, **regardless of their chemical composition,** as long as they pose high pollution risk. The approach helps ensure that the new treaty's provisions give proper consideration to specific groups of **plastic products**; a feature that is missing in existing treaties such as the Basel Convention (on hazardous waste) and the Stockholm Convention (on Persistent Organic Pollutants). Those treaties focus on plastic-relevant waste and chemicals more generally and have not sufficiently addressed the issue of potential product specific controls.

Another possible – and potentially complementary – route to categorizing plastic would be based on either polymer type or life-cycle stage. The use of a polymer-based approach would, for example, lend itself to the identification of plastic products for which regulations focus on the use substances such as chemicals and additives that have a toxic effect on human health. This approach could work in parallel with the product-group approach: polymers and chemicals could be added to separate lists, alongside lists of product groups, in the annexes that elaborate on the applicable scope of the treaty's core provisions. Controls by lifecycle stage may also complement a product group approach. Report Two highlights that some control measures may be usefully applied in common across multiple product groups at certain stages in the plastic value chain.

In this research, polymer type and additives, as well as life-cycle stage, are considered when and if they increase the probability of the plastic products ending up in the environment and/or the potential harms when they do.

Art Installation - Benjamin Von Wong - Turn off the plastic tap © Markus Winkler / WWF-Germany

CONSISTENCY WITH OTHER INTERNATIONAL CONVENTIONS

Although this is the first international treaty solely focused on plastic pollution, consistency with other international treaties that cover certain products, materials or manufacturing practices is needed. This includes, in particular, the Stockholm Convention on Persistent Organic Pollutants (POPs) and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal.

The Stockholm Convention defines POPs as "chemical substances that persist in the environment, bioaccumulate through the food web, and pose a risk of causing adverse effects to human health and the environment." The Stockholm Convention provides binding measures to reduce the harm of some plastic products through their life cycle, including the waste phase. Some flame retardants used in plastic production have been listed in Annex A of the convention, requiring their production and use to be eliminated by parties to the convention.[12]

The Basel Convention sets out parties' obligations covering many forms of waste: toxic, poisonous, explosive, flammable and others.[13] In May 2019, the Conference of the Parties to the Basel Convention adopted decision BC-14/12 by which it amended Annexes II, VIII and IX of the convention in relation to plastic waste. The decision includes in its sections I, II, III and VII a set of actions for preventing and minimizing the generation of plastic waste, improving its environmentally sound management and controlling its transboundary movement; reducing the risk from hazardous constituents in plastic waste; and public awareness, education and information exchange. Parties may have already implemented some national waste disposal methods under Basel Convention that would otherwise be recommended control measures under the plastic pollution treaty. There are similarities between technical guidance on environmentally sound management under the Basel Convention and some of the control measures proposed in for the plastics treaty; however the plastics treaty can specify particular requirements in relation to product groups throughout their lifecycle as binding and detailed commitments.[14]

A RISK-BASED APPROACH TO PRIORITIZATION

Current data enables clear conclusions related to the most polluting plastic product categories. It shows, with a high level of confidence, that certain product groups and indeed specific products are key contributors to plastic pollution, and that some of these pose particular risks when they end up in the natural environment. Existing data also shows that the nature of this problem is transboundary, and only international action can solve the problem at the scale needed.

This being said, it is not possible to undertake a full analysis of all plastics with the potential to be high risk as data is not always consistent or available at the level of granularity needed. In this regard, the treaty should align with the precautionary principle: while we may not fully understand the impacts of every plastic product in the terrestrial, freshwater or marine environment, we know the impacts of plastic pollution are negative, and expect (in line with the trend to date) that furthering our understanding will highlight new and potentially more severe associated impacts. The analysis here is not expected to capture everything that the treaty may eventually be able to accomplish, but deliberately focuses on prioritizing the biggest and most urgent wins.

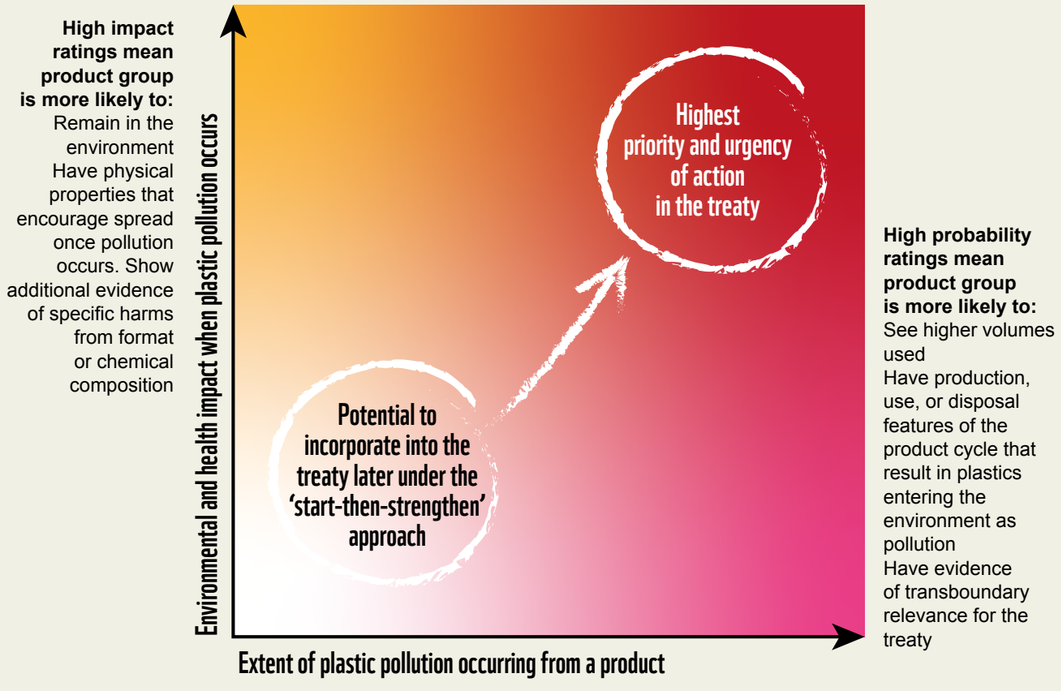
This report uses existing data in identifying high-risk plastic products based on current knowledge and identifies known risks that definitively require regulation, as shown in Figure 1-3 below.

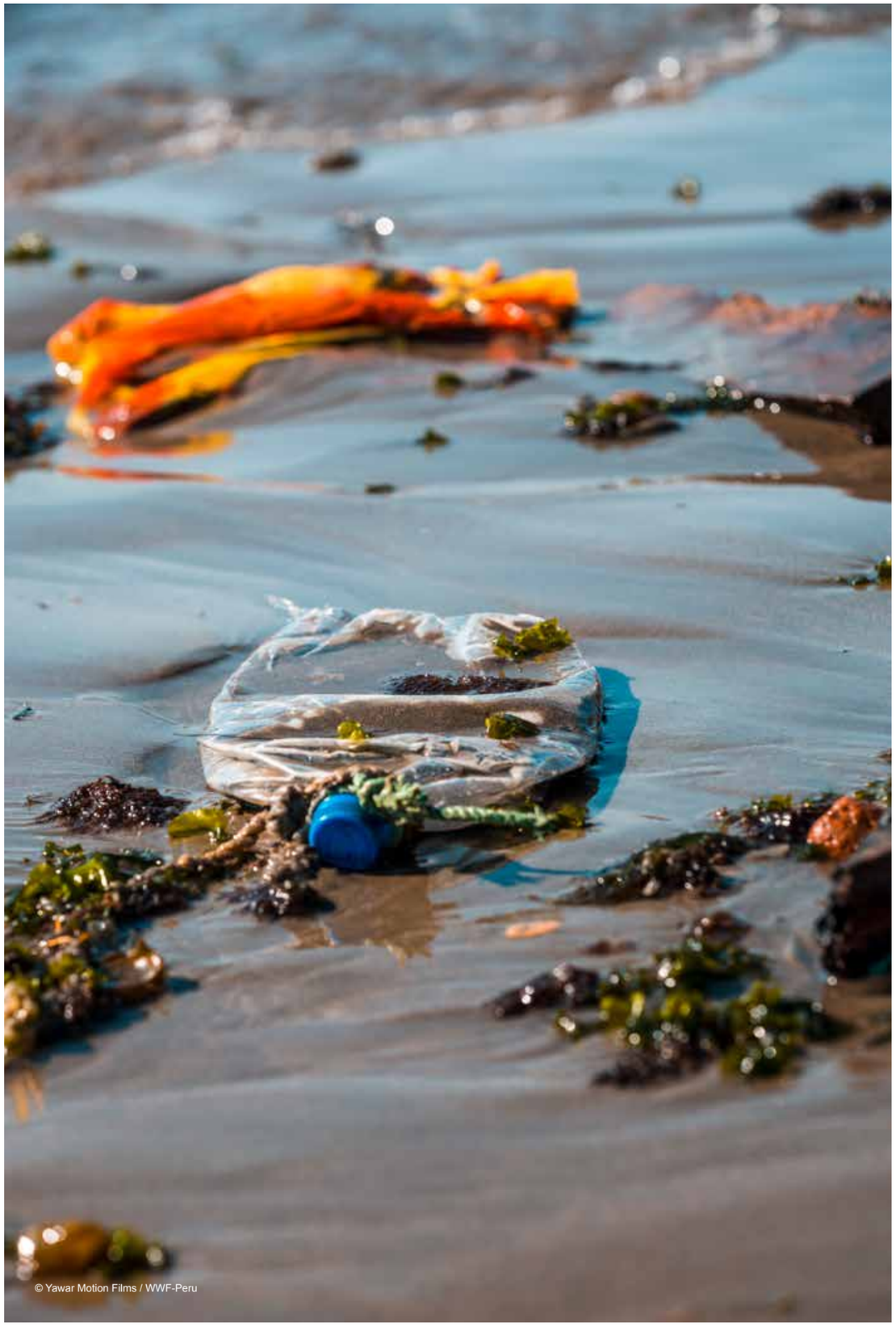
Within this risk-based approach, risk is calculated on the two dimensions of plastic pollution:

- Probability of the plastic ending up in the environment
- Impacts on the environment and human health when this occurs.

Due to the nature of the evidence base, a number of factors are considered in the determination of both these dimensions. This is detailed in **Chapter 3.**

Figure 1-3: Initial risk assessment dimensions to determine the urgency of action on plastic pollutions for specific product groups

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CHAPTER 2

IDENTIFYING THE MAIN PRODUCT GROUPS

A previous WWF study shows that practically all plastics found in the marine environment belong to three types: single-use plastics, fishing gear and microplastics (see Figure 2-1).[15] Further analysis of the specific plastic products within these types could reveal the reason why. The sectors, functions, characteristics and usage patterns of these products stand out as the likely explanation. These products belong to **sectors** or serve **functions** that are ubiquitous (such as packaging); are particularly prone to exposure and risk of loss to the environment (such as fishing gear); have short **use patterns** (single-use non-packaging items); or possess **characteristics** that lead to microplastic pollution (being primary microplastics themselves, or easily releasing secondary microplastics in use and as waste). These factors indicate that there are **commonalities between products that pose high pollution risks**.

This observation became the starting point of this research, which commences by surveying the full range of existing functions, characteristics and usage patterns of different plastic products, recognizing their points of commonality, and grouping them to allow for interpretation and regulation at a product group level.

A sectoral approach was first used to group products. The sectors of packaging, fisheries and aquaculture, and agriculture each comprise products that share features (in design, application, and impacts) and can be placed in distinct groups. The unique function and mostly similar use patterns of plastic packaging set it apart from other sectors. For fisheries and aquaculture, as well as agriculture, the specific placement and use of plastic products in the environment set these sectors apart. Other sectors such as electrical and electronic equipment, household goods (such as furniture), construction materials, automotive components (though with a partial exception for tyres) tend to use plastic products that typically see longer use-span, low mobility if they escape to the environment, and less frequent direct disposal in the environments. These are placed together one product group for this analysis but could be further sub-divided by negotiators when controls for these products are prioritised.

However, a pure sectoral approach to product grouping is limited. Products used across multiple sectors could result in high pollution risk because of specific characteristics. Recognizing this, the analysis created additional groups for products that are designed to be short-lived and disposable, and those that release microplastics during their use.

Finally, primary microplastics constitute a product group in their own right, since their properties, usage patterns and pathways to the environment are distinct from those of other products.

Four main categories were recognized for further subgrouping: packaging, characteristic-specific products, sector-wide applications, and microplastics.

- **Packaging** refers to products, made wholly of plastic materials or of plastic materials in combination with other materials, that are used to contain, protect, handle, deliver and present goods at all points of the value chain, i.e., from raw materials to finished goods, and from the producer to the user or consumer.
- **Sector-specific products** are grouped together where the sector the plastic products are intended for is a key determinant of whether a significant proportion will be used or disposed of directly in or close to sensitive ecosystems, including aquatic, marine and terrestrial environments.
- **Characteristic-specific products** include plastic products that do not belong to specific sectors but are brought together based on characteristics that increase pollution risks (such as single-use non-packaging items, or products with longer use-span that release secondary microplastics during use). Further subgroupings were developed after the elimination feasibility assessment, as some subgroups within the larger group require differentiated controls.
- **Primary microplastics** are tiny plastic particles up to 5mm in size, of various shapes, and manufactured for use in plastic products (sometimes referred to as preproduction plastics), or to be added to plastic or non-plastic products (e.g., microbeads in cosmetics, industrial abrasives and paints, etc.). These are distinguishable from secondary microplastics, which arise from the fragmentation of larger plastic items over time.

During the process of forming these groupings, it became essential to split some of them further into subgroups, to reflect additional distinctions within the broader product groups (e.g., the use of packaging in contact-sensitive applications, like food and beverages or pharmaceuticals, which have different characteristics and usage patterns from packaging in non-contact sensitive applications).

A second level of subgroupings was also needed in some cases due to distinct use patterns or functions within a subgroup. For instance, food and beverage packaging is split into single-use and multi-use subgroups; while single-use products are split into the unnecessary, like balloon sticks, and the necessary, like contact lenses. This was carried out multiple times as the assessment was conducted for each subgroup. This iterative approach should ensure that the groups both make intuitive sense to negotiators and are also amenable to assessment and identification of the relevant control measures (which is the subject of Report Two).

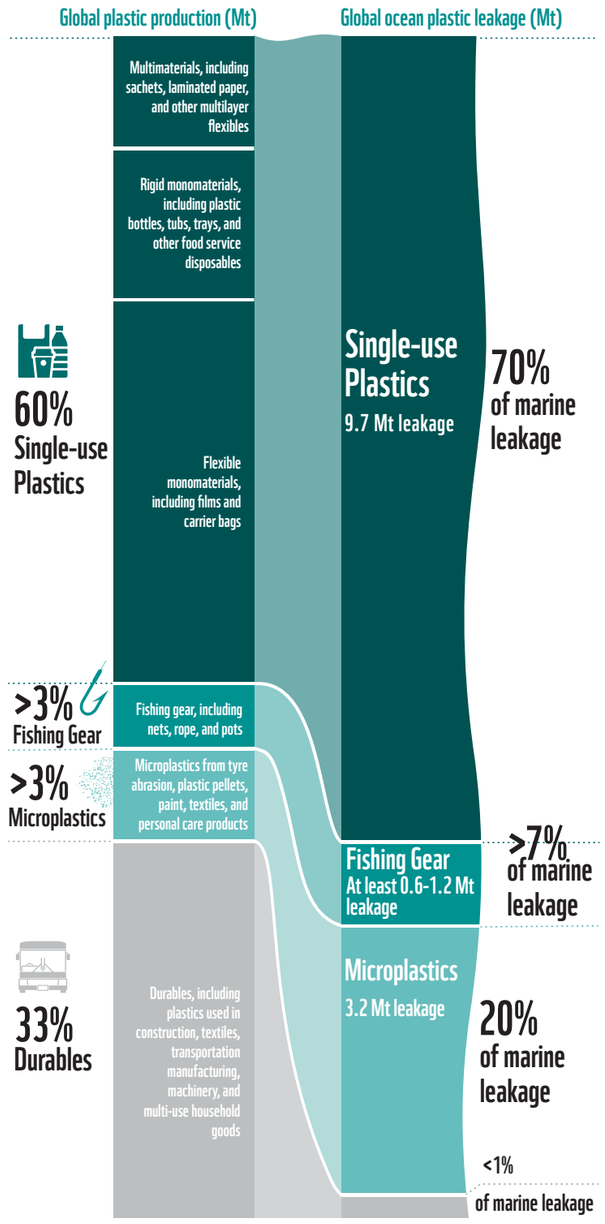
What is meant by "necessary"?

The aforementioned term *"necessary"* has been used to reflect the fact that some plastic products currently do not have suitable alternatives and cannot be eliminated without reducing the wellbeing of particular groups (e.g., disposable contact lenses for sportspeople). Items that are considered "necessary" are therefore important, but in the long term, we could and should reduce our reliance on them. Note that this is differentiated from the term "essential" which would suggest that some plastic products might be indispensable in the long term, and therefore could be considered for exemptions from regulation.

The product groups are deliberately kept broad, in order to capture the wide-ranging applications and uses for the products within them. Comprehensive and exhaustive lists would be almost impossible to develop given the countless plastic materials, types and applications, and even more so to monitor and enforce (e.g., requiring clear definitions of each plastic product, control measures prescribed at the product level, and data on the flows of each one at a global scale). This also avoids the risk that specific or novel applications, that may not be included in any detailed list of products at present, escape the new international regulatory framework.

The descriptions of the product groups below have been built up iteratively from the nature of the plastic products analysed, rather than derived from existing definitions. **Table 2-1** below summarizes the plastic product groupings used in this research. Further descriptions of these are in **the Appendix.**

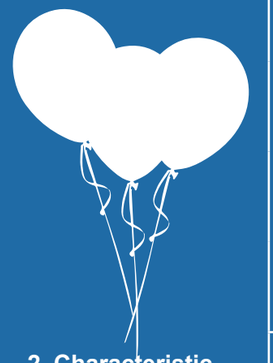
Figure 2-1: Marine plastic pollution is caused by specific products and applications



Source: PEW and SYSTEMIQ, 2020; Note: Volume of plastic fishing gear production is indicative only given lack of reliable global estimates. Absolute volume of fishing gear 'leaked' follows previous WWF estimated ranges, while acknowledging some sources find significantly higher proportions of fishing gear in marine samples (~80% of the Great Pacific Garbage Patch, The Ocean Cleanup Project, 2022).

Table 2-1: Plastic product group categories

Necessary | Other | Packaging | Characteristic-specific products | Sector-specific products | Primary microplastics

PRODUCT GROUPING	SUB-GROUP 1	SUB-GROUP 2	SUB-GROUP 3	EXAMPLES
 **1. Packaging**	Contact sensitive	Food and Beverage	1a. Single-use food & beverage (Necessary / Other)	Beverage bottles, takeaway containers, crisp packets, sachets and pouches, nets and wraps for fruit and vegetables, very lightweight plastic carrier bags used as primary packaging for loose food items,[16] EPS fish boxes
			1b. Multi-use food & beverage	Reusable beverage bottles, containers and cups
		Cosmetics & personal care	1c. Cosmetics & personal care (Necessary / Other)	Toothpaste tubes, perfume spray bottles, shampoo and soap bottles, pots and tubs of creams, lotions and scrubs, beauty products like lipstick and mascara tubes
		1d. Pharmaceutical & medical		Medication bottles, blister packs for pills, protective casings and inserts for medical devices, IV bags, test tubes
		1e. Other contact sensitive		Packaging for animal feed, veterinary devices, hazardous products
	1f. Non-contact sensitive			Packaging for products not listed above – household goods, stationery, electronics, plastic carrier bags, etc., including secondary or shipping/ transport packaging where relevant
 **2. Characteristic-specific products**	Single-use Short-lived	Fibres/ non-wovens	2a.Necessary	Some absorbent hygiene products (e.g., nappies, sanitary pads, incontinence pads, tampons), PPE, filters in engineering systems
			2b. Other	Wet wipes, cigarette butts, disposable vacuum filters, plastic tea bags
		Other	2c.Necessary	Contact lenses, bin bags, plastic PPE
			2d. Other	Plastic balloons, cutlery/plates/ cups, ear bud sticks, disposable e-cigarettes
	Longer life items	2e. Cause significant secondary microplastic release		Tyres, synthetic textiles, paint
		2f. Other		Furniture, white goods, durable toys
 **3. Sector-specific products**	Marine, aquatic and terrestrial	3a. Marine/aquatic – fishing & aquaculture		Nets, lines, pots and trawls, plastic mesh, PVC piping, fish aggregating devices (FADs)[17]
		3b. Terrestrial – agriculture		Mulch film, plastic silage wrap, greenhouse tunnels[18]
	3c. Other			Electrical/electronic equipment, construction materials, automotive components, household products
 **4. Primary microplastics**	4a. In application			Microbeads in personal care products such as toothpastes, skin care and scrubs; antifouling application on ship hulls; microplastics used in industrial applications such as printer inks, paints, spray paints, injection mouldings and abrasives; microplastic coatings surrounding fertilizer granules.
	4b. Pre-production			Plastic resin pellets, flakes or powders

THE CHALLENGE OF CATEGORIZING PACKAGING

Categorizing packaging by product group proved challenging within this research. Packaging is a large group, accounting for 31 to 44% of plastic production, and much of it is single-use and short-life. The use case for consumer packaging in particular poses particularly high pollution risk (high volume of low-value, lightweight and disposable items in widespread circulation). The key challenge in regulating packaging is that, despite its high-risk nature from the perspective of plastic pollution, packaging can and does perform necessary functions. Applied well, its role in protecting and preserving products, and especially food, can help reduce overall waste and wider environmental harms, and meet wider health and safety requirements for products.

Some logical splits to the packaging group are possible. Firstly, a distinction between contact-sensitive and non-contact-sensitive packaging (described in greater detail in **the Appendix**) is likely to be useful to negotiators to avoid any unintended consequences of regulations in this product group. Additionally, the contact-sensitive category has been broken up into subgroups based on key areas of packaging application to enable further consideration of the specific use cases for contact-sensitive packaging prior to regulation.

Unlike for most other product groups, determining whether plastic packaging is 'necessary' is usually contingent on how and where it is being used, rather than the nature of the product itself. In attempts to split packaging products into 'necessary' and 'other' by either product or product group, this research repeatedly found the same products to be listed in both categories (for example, some applications of plastic wrap may be performing useful functions in terms of product preservation and protection, while others may be wasteful).

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This challenge is reflected in packaging elimination strategies in national policy to date, which frequently:

- Target more specific product, polymer and application combinations, rather than product groups or even products (e.g. a prohibition on 'polystyrene takeaway boxes' is both polymer and application specific rather than being a restriction on single-use containers, or even unsealed single-use containers)
- May not be plastic specific, to reduce substitution risks (e.g., charges for single-use carrier bags made of any material)
- Focus on reductions in the total volume of packaging, rather than in the total number of packaging items of specific products or product groups. Some control measures, such as reuse, may in fact result in both, by improving packaging circulation and management, reducing the total number of items in circulation, and reducing the total amount of plastic used in the packaging system.

In addition, the assessment of the feasibility of elimination of packaging subgroups raised a number of concerns:

- The needed use of packaging is heavily dependent on the supply chain or national context. For example, overpackaging (e.g., unnecessary layers or overuse of material) is a common problem. However, in some contexts, sensible use of additional packaging products might mitigate issues like supply chain food waste.
- If only plastic packaging is banned, risk of material substitution is relatively high and could have significant unintended consequences given the high volumes and short life of many single-use packaging products.
- Over a hypothetical 10-year timeframe, alternatives to single-use packaging products do not yet appear to become sufficiently widespread to enable elimination (bans) of specific packaging subgroups within this timeframe. However, targets for reduction, as well as requirements around reuse, may contribute to more rapid changes in overall practice than currently anticipated. This could in turn gradually increase the feasibility of elimination measures, especially for food and beverage packaging.

The categories set out in **the Appendix** represents a compromise that takes into account these regulation challenges. Elements of both product and application are reflected in the categorization. This typology aims to facilitate discussions of cases where negotiators wish to regulate at a more specific product level, or across the high-level packaging category as a whole. This is an area where product group controls, in isolation, will likely be insufficient. A more nuanced approach to design control measures will be necessary: potential options for such an approach are discussed in greater detail in Report Two.

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CHAPTER 3

ASSESSING POLLUTION RISKS OF PRODUCT GROUPS

The assessment of product groups' pollution risks is based on the available data, literature and expert assumptions, and considers both the evidence of actual (i.e., existing) plastic pollution and the potential risk of pollution – where direct evidence is more limited. The quality, quantity and confidence of available evidence on plastic pollution is highly variable, with low comparability across plastic product groups, and variations and inconsistencies at the country level. Because of this, the research uses not only aggregated or quantitative data but also other strands of evidence for each plastic product group. The assessment considers both direct evidence and supplementary logical tests on the nature of the product and context in which it is used, where necessary, to reveal insights on the pollution probability and impact of these products.

The existing evidence base has a bias towards marine (and often specifically coastal) data collection and estimates. So, despite the fact that the treaty will target all plastic pollution, this study still relies on marine litter evidence. In many cases this is a good proxy for overall probability of introduction to the environment for certain product groups, but other actual or potential impacts are identified where possible.

The following two sections elaborate the assessment criteria: **probability and impact**. Each product group is assessed against these criteria, using a traffic light system, where red indicates high probability/impact, amber indicates medium probability/impact and yellow indicates low probability/impact. The results are summarized in the **tables 3-1 to 3-4.**

PROBABILITY THAT PRODUCTS ENTER THE ENVIRONMENT

Probability assessment is the first part in the research's overall risk evaluation. The assessment takes into account any evidence that indicates a plastic product group is either already contributing, or is likely to contribute significantly, to plastic pollution. The probability of a product group entering the environment is assessed according to three criteria:

- **Volume of plastics.** While the volume produced/in circulation is not a direct proxy for the likelihood that product groups will enter the environment, higher volumes clearly indicate greater potential for plastic pollution. Data on production, consumption and waste is also sometimes more available and comparable than direct evidence of specific plastic products entering the environment. In the assessment, volume is not considered solely on a weight basis but is coupled with item count as a key consideration, since many product groups generate concern precisely because items arise in extremely large numbers, irrespective of individual item weight.
- **Tendency to enter the environment.** In addition to direct evidence of its presence, a number of less direct considerations can help identify the chances of a plastic product ending up in the environment, which is here called 'tendency to enter'. Factors include how and where products are used, and the physical, process-related and behavioural factors that may increase the tendency of the item to end up in the environment.

  For example, plastic products that are used in direct contact with natural ecosystems, such as those used in fishing, aquaculture and agricultural sectors, can make recovery at end-of-life challenging even when it is intended – which often it is not. Use or disposal in proximity to obvious environmental pathways, such as watercourses or coastlines, might also increase probability of plastic pollution. Some use cases involve inevitable shedding of microplastics, with no prospect of recovery.
- **Potential for transboundary movement of plastic pollution.** Although not a strict measure of 'probability', this dimension is considered here to test the probability that a given product group may cause *international* plastic pollution concern. Practically all plastics entering the environment can pose transboundary concerns, where pollution arising in one country can affect another. This is because of the lightweight, buoyant and durable nature of many plastic products, and their propensity to be transported over long distances either in water or in the air. However, in the context of an international treaty negotiation, this study adds an additional assessment criterion to ensure international relevance is demonstrable.

IMPACTS WHEN PRODUCTS DO ENTER THE ENVIRONMENT

The second conventional measure in a risk assessment is the harm that can occur. As with consideration of probability above, consideration of harm in this case must consider both harms already occurring and potential harms that may occur.

This study first considers the existing evidence on the types of plastic pollution that have already been recorded in the environment and the literature around their negative effects. However, recognizing that this evidence is not always available at the level of individual product groups, and that all plastic pollution has the potential to cause harm, two additional criteria are considered. In particular, the physical properties of certain plastic products may lead to impacts that are disproportionate to the volume of plastics entering the environment (e.g., plastics' durability, buoyancy, rigidity). Additionally, the chemical properties of particular plastic products may have specific negative impacts on human health, wildlife and ecosystems, while other products may be of concern due to their socioeconomic impacts (flooding, negative impacts on industry and tourism, etc.). The specific impacts to human health, wildlife and ecosystems, and socioeconomic impacts, have been considered together.

The following three criteria are used to assess negative impacts once plastic enters the environment:

- **Prevalence.** This criterion tends to correlate with the assessment of probability of leakage, and is assessed based on evidence of actual presence of a product in the environment as plastic pollution**.** Products that are lightweight, buoyant, widespread and long-lived after entering the environment are likely to appear more prevalent in the evidence. High prevalence indicates a product's long-lasting and widespread negative impacts. On the other hand, as evidence of prevalence is not always as extensive or granular as required for this study, limited evidence of prevalence is not used to discount the pollution probability of a product group.
- **Physical properties.** This includes a direct assessment of evidence on whether the pollution caused by a product group occurs as micro, meso or macro plastics (or as a combination of two or all three of these), as well as logical tests to supplement cases where direct evidence of prevalence is lacking. For example, physical features (such as the ability to float or remain suspended in a water column) will increase the potential for adverse impacts over time.

Specific related harms. This covers cases where the nature of the product group creates additional hazards when it arises as pollution. This includes negative impacts associated with specific chemical properties (e.g., toxicity, bioaccumulation), impacts to wildlife (e.g., ingestion, ghost fishing), implications for human health (e.g., surface water flooding, promoting conditions for mosquito breeding) and wider economic implications (e.g., impacts on tourism, fisheries, agriculture and other sectors).

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3.1. PACKAGING

Plastic packaging is used in numerous applications and contexts, due to its versatility, durability and flexibility in application. However, in many packaging applications, these same properties are the ones that pose issues for plastic pollution. For example, plastic packaging is often designed to be durable but lightweight to reduce transport and storage costs, and to enable the consumption of food and beverage items 'on the go'. These same properties mean that they are more susceptible to entering the environment (as they are easily blown or washed away) and remain in the environment for long periods of time when they do escape.

Most plastic packaging is also of very low value relative to the products it holds, which means the packaging is more susceptible to being discarded or disposed of, rather than reused or repaired. This also increases the chances of the plastic not being collected for recycling since the resulting recyclates do not command high value. Finally, packaging that is managed in formal waste systems often poses problems for recycling, due to the wide variety of polymers, additives, adhesives and components that are used, for which suitable sorting and recycling processes rarely exist. This further lowers its value in a circular value chain.

A large proportion of plastic packaging therefore ends up burned in incinerators (contributing to greenhouse gas and toxic emissions) or dumped in landfills, which themselves may be prone to leakage into the environment during severe weather events. The volume of packaging, and the lack of capacity for waste management systems to capture and properly deal with all types of plastic packaging, **increases the probability** of it ending up in nature.

While national policymakers in some countries have focused on tackling the issues associated with food and beverage packaging in recent years, there are challenges to the circularity of other packaging subgroups as well. In the case of plastic packaging for cosmetics and personal care products, for instance, there is significant variation in polymer compositions, and serious issues with overpackaging (to make products appear larger or more 'premium').

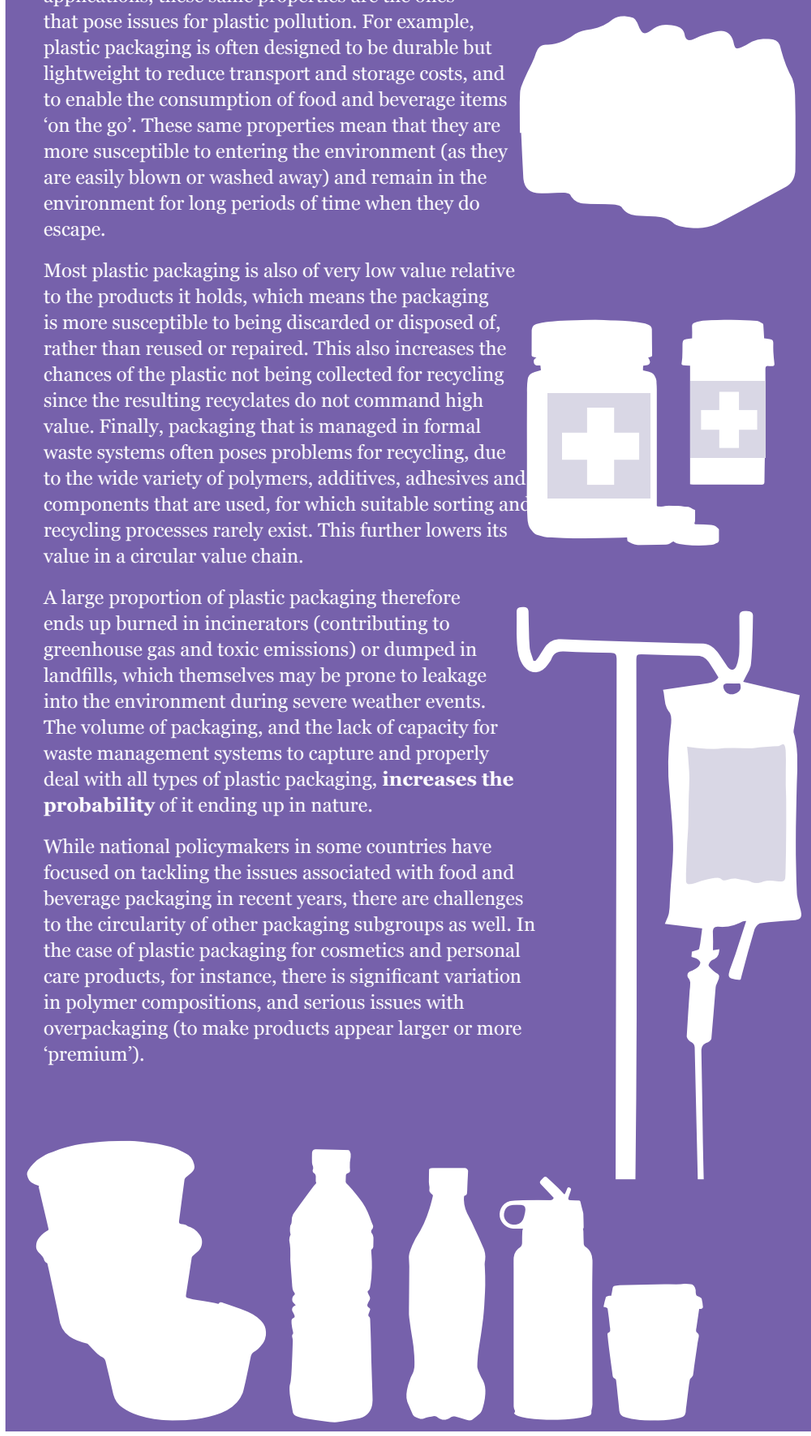


Table 3-1: Assessment of plastic product groups: packaging

PACKAGING GROUPS		PROBABILITY			IMPACT		
		VOLUME IN CIRCULATION	TENDENCY TO ENTER	TRANSBOUNDARY RELEVANCE	PREVALENCE	PHYSICAL PROPERTIES	SPECIFIC RELATED HARMS
1A. PACKAGING: CONTACT SENSITIVE – SINGLE-USE FOOD AND BEVERAGE	Necessary / Other	High	High	High	High	High	Moderate
		The biggest use of plastics is in packaging, of which the biggest application is food and beverage packaging. High chance of littering, as these are designed for single use and on the go consumption in many cases, most are lightweight and easily blown away. Low value, current design difficult to empty or wash and limited incentives for reuse. Buoyancy increases the likelihood of wave-driven cross-border transportation for many products.			Commonly found in marine, aquatic and terrestrial litter. Prone to leakage from waste management systems. Tend to fragment and disperse. Phthalates and other substances of concern (SoCs) in packaging lids can migrate into food and beverages packed in glass, these also leak into soil and groundwater, however the use of these substances in food and beverage packaging tends to be closely regulated to ensure human safety, so risk likely to be less pronounced than for other plastics.		
1B. PACKAGING: CONTACT SENSITIVE – MULTI-USE FOOD AND BEVERAGE		Low	Moderate	High	Low	Low	Moderate
		Designed with reuse/refill in mind, lower tendency to enter the environment both due to use case and a smaller assumed total number of items for a given purpose. If it does end up in the environment, the transboundary impact is just as high as for the single-use items, though current volumes mean this is not yet a significant issue			Not commonly found in litter and are less likely to fragment compared to single-use products. Phthalates and other SoCs in packaging lids for glass containers can migrate into food and beverages, and leak into soil and groundwater. However, the use of these substances in food and beverage packaging tends to be closely regulated to ensure human safety, so risk likely to be less pronounced than for other plastics		
1C. PACKAGING: CONTACT SENSITIVE – COSMETICS AND PERSONAL CARE	Necessary / Other	Moderate	Moderate	High	Moderate	Moderate	Moderate
		Tend to be consumed in the home, and thus relatively less prone to enter the environment; with some exceptions for specific use cases on the go (like sunscreen, travel sizes, shampoo sachets, etc). However most items designed for single use, not easy to empty/ refill, and often unrecyclable due to use of complex/ composite materials. If items do end up in the environment, the likelihood of transboundary impact is just as high as for equivalent packaging formats.			Current data shows that these are sometimes found in litter, though not as commonly as food and beverage packaging. This is likely due to leakage from waste management systems rather than direct littering, though there are some exceptions for formats like sachets. These packaging formats are likely to fragment and degrade in the environment, though can be more durable in design than food and beverage packaging (as packaging in 1c is more often designed to hold product/dispense products for a longer in-use period) and so may take longer to do so.		
1D. PACKAGING: CONTACT SENSITIVE – PHARMACEUTICAL AND MEDICAL		Moderate	Moderate	High	Low	Moderate	Moderate
		Tend to stay within waste management systems from hospitals or the home. Though the products this packaging contains are considered high value, the packaging is typically designed for disposal/single use and often viewed as hazardous. This means recyclable packaging tends to be disposed of with hazardous packaging and sent for disposal/incineration. Items sometimes illegally dumped/burned/lost from waste management systems and enter environment. If items do end up in the environment, the transboundary impact is just as high as for other packaging formats.			Not commonly found in litter, likely to fragment and degrade in the environment, though over varying periods of time as some forms of packaging are more durable for safety purposes, while others are flimsy and lightweight.		
1E. PACKAGING: OTHER CONTACT SENSITIVE		Low	Moderate	High	Moderate	Moderate	Moderate
		Tend to stay within waste management systems, less likely to enter the environment. If items do enter the environment, the likelihood of transboundary impact is just as high. Often for short-term use.			Not as commonly found in litter. Often flimsy, tend to fragment and degrade		
1F. PACKAGING: NON CONTACT SENSITIVE		Moderate	Moderate	High	Moderate	High	High
		Tend to be consumed in the home, less prone to enter the environment. If items do end up in the environment, the likelihood of transboundary impact is just as high.			Some commonly found in litter, tend to accumulate in illegal dumps. Tendency to breakdown. More likely to contain harmful substances than contact sensitive packaging.		

*Note: refer to **Chapter 2,** and the ***Deep dive* 'The challenge of categorizing packaging'** for explanation of 'necessary/other' packaging subgroup

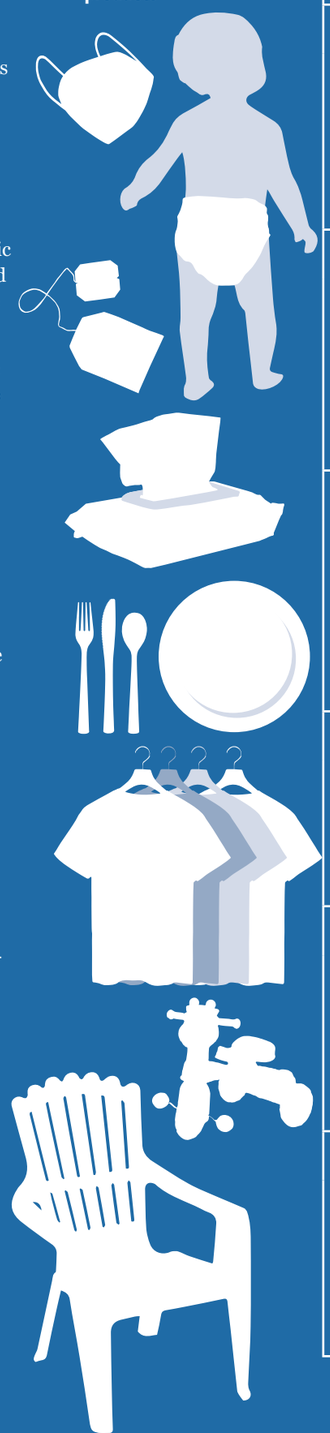
3.2. CHARACTERISTIC-SPECIFIC PRODUCTS

The characteristic-specific products category includes plastic product groups based on certain characteristics shared by the products that increase their pollution risks. The first subgroup includes widespread, short-lived or single-use items that are often of low value and utility. These are usually consumer products, and include items like balloon sticks, cotton bud sticks, plastic cutlery, wet wipes, disposable diapers, etc. Some are made using plastic fibres (non-woven), like wet wipes, while others may be manufactured using more conventional rigid or flexible plastic polymers (like plastic cutlery). This subgroup makes up a large proportion of plastic waste, and correspondingly, contributes highly to plastic pollution. Many such items have already been identified in global reviews of single-use plastic pollution, marine pollution and beach clean-ups.

In many cases, these items are discarded directly in the environment (e.g., disposable cutlery used in on-the-go food applications), while in others they may end up in formal waste management systems but lack suitable options for recycling (e.g., disposable diapers). Others (e.g., sanitary items, cotton bud sticks, wet wipes, etc) are flushed by consumers, who may believe they are biodegradable or water soluble. Since wastewater treatment works and sewage systems often cannot tackle the accumulation of such items in pipes, they often contribute to flooding due to blockages or reach waterways through sewage discharge. For example, one UK study found that the majority of sewer blockage material recovered consisted of wipes that were not designed to be flushed. Baby wipes accounted for over 75% by weight of identifiable products, with surface wipes, cosmetic removal wipes and feminine hygiene products accounting for approximately 20%.[19]

A final subgroup includes products that are often long-lived but that release significant microplastics due to wear and tear during use (such as textiles, paint and tyres). This means their pathways to the environment are distinct from the short-lived or single-use subgroups. Microfibres from textiles and tyre dust have been identified as key sources of microplastic pollution, accounting for as much as ~35% and ~28% of global releases of primary microplastics to the ocean respectively.[20] These trends are increasing, due to the ever-increasing use of private vehicles in transport systems around the world, as well as clothing trends like fast fashion' which contribute to increasing textile consumption and waste generation. Other long-lived products, such as furniture and durable toys, may also include plastic components that, once in the environment, can have harmful impacts. However, these are comparatively less likely to release secondary microplastics during use, are less commonly found in the environment, and tend to be captured in waste management systems due to their higher value, use patterns and durability.

Table 3-2: Assessment of plastic product groups: Characteristic-specific products

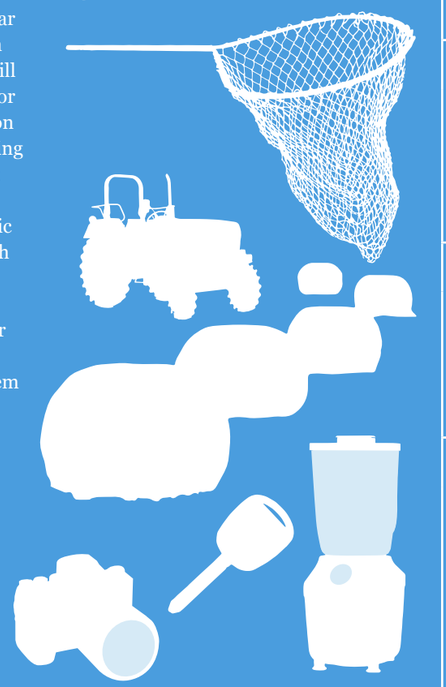


CHARACTERISTIC-SPECIFIC PRODUCTS	PROBABILITY			IMPACT		
	VOLUME IN CIRCULATION	TENDENCY TO ENTER	TRANSBOUNDARY RELEVANCE	PREVALENCE	PHYSICAL PROPERTIES	SPECIFIC RELATED HARMS
2A. CHARACTERISTIC-SPECIFIC PRODUCTS: SINGLE-USE SHORT-LIVED – FIBRES/NON-WOVEN – NECESSARY	Moderate	High	High	High	High	High
	Designed for household/commercial use. Tend to be disposable and viewed as low-value/hazardous once used. Prone to flushing - fibres are usually transferred to the environment during overflow events. Not completely removed in the screening phase in wastewater treatment.			Single-use menstrual products among most commonly found single-use plastic items in marine environments. Disintegration leads to microplastic release into water. Size, fibre and floating properties mean high-risk of ingestion in wildlife.		
2B. CHARACTERISTIC-SPECIFIC PRODUCTS: SINGLE-USE SHORT-LIVED - FIBRES/NON-WOVEN – OTHER (NON-NECESSARY)	Moderate	High	High	High	High	High
	Prone to incorrect disposal (littering, flushing). Fibres are usually transferred to the environment, particularly during overflow events. Tend to break down into fibres and be lightweight/buoyant leading to potential transboundary impact			Wet wipes and cigarette butts among most commonly found single-use plastic items in marine and terrestrial environments. Size, fibre and floating properties mean risk of ingestion in marine wildlife is high. Some items contain hazardous chemicals which can get into waterways and oceans; the chemicals inhibit plant growth and can be harmful to wildlife.		
2C. CHARACTERISTIC-SPECIFIC PRODUCTS: OTHER SINGLE-USE SHORT-LIVED ITEMS – NECESSARY	Moderate	Moderate	High	High	High	High
	Often consumed within the household and less likely to be littered. Can be very small or lightweight/flimsy – easy to miss in clean-up efforts, easily blown away and dispersed on wind/water. Likelihood of ending up in the environment lower than other single-use items; but if they do then transboundary impacts is just as high.			Lightweight and mobile for wind-transfer and water systems. Likely to be ingested by marine wildlife and birds. Rigid items can be easily fragmented to create sharp edges. Possible leakage of BPA, phthalates, heavy metals or allergens. Greater risk of leakage of substances of concern than that of contact-sensitive applications.		
2D. CHARACTERISTIC-SPECIFIC PRODUCTS: OTHER SINGLE-USE SHORT-LIVED ITEMS – OTHER (NON-NECESSARY)	Moderate	High	High	High	High	High
	Often consumed outside of the home so higher chance of littering. Very low value which can lend itself to littering and improper disposal. Easily lost from waste management systems.			Single-use plastic items including disposable cutlery and utensils have high prevalence in plastic found in the ocean. Lightweight and mobile through wind transfer and water systems. Items can often become fragmented to create sharp edges, causing harm to wildlife.		
2E. CHARACTERISTIC-SPECIFIC PRODUCTS: LONGER LIFE – CAUSE SIGNIFICANT SECONDARY MICROPLASTIC RELEASE	Moderate	High	Moderate	High	Moderate	High
	Used in applications that are in direct contact with air/water/land. Majority of losses of microplastics to the oceans come from road run-off. Tend not to be picked up in wastewater treatment/filters and dispersed widely due to micro properties			Two-thirds of microplastic releases are due to the laundering of synthetic textiles and erosion of tyres while driving. Susceptible to leakage in the supply chain. Can act as a source and sink for toxic agents, chemical additives and heavy metals that leach out of plastics and can be absorbed into the environment.		
2F. CHARACTERISTIC-SPECIFIC PRODUCTS: LONGER LIFE – OTHER LONGER LIFE ITEMS	Moderate	Low	Moderate	Low	Low	Moderate
	Items tend to be used in the home, less likely to end up in the environment. Can be subject to dumping, if costs of disposal are high. Mostly durable, heavy, non-buoyant items, meaning low transboundary impact. Exceptions include toys or long-life utensils.			Not commonly found in litter, some prone to dumping. Dense and heavy items have little mobility in the environment, barring exceptions. Lower impact on marine wildlife from ingestion or entanglement until broken down. Dumped waste may contain hazardous chemicals which leak into soil and groundwater.		

3.3. SECTOR-SPECIFIC PRODUCTS

The use of plastics in sectors like fishing, aquaculture and agriculture poses particular pollution issues, since products are used in direct contact with the environment and will directly enter the environment if not used or discarded correctly. A significant proportion of fishing and aquaculture gear is made using plastic components, which are also subject to degradation and microplastic leakage during their lifetimes. In some cases, plastic products in these sectors do not have a high enough value to ensure they are recovered if accidental loss does occur, and adequate waste management options are often either lacking or too expensive. The physical properties of some of these items make them particularly harmful if they do end up in the environment (e.g., fishing lines, ropes and nets which are deadly to wildlife that continue to be ensnared in them).

Table 3-3: Assessment of plastic product groups: sector-specific plastic products



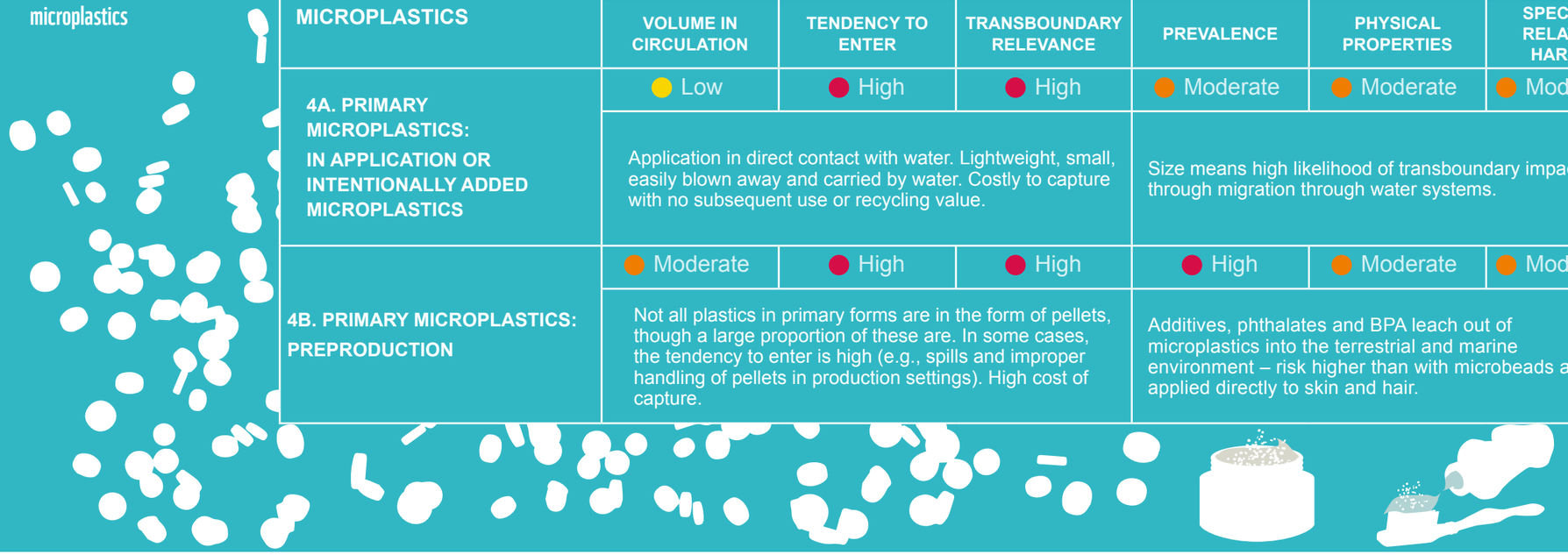
SECTOR-SPECIFIC PRODUCTS	PROBABILITY:			IMPACT:		
	VOLUME IN CIRCULATION	TENDENCY TO ENTER	TRANSBOUNDARY RELEVANCE	PREVALENCE	PHYSICAL PROPERTIES	SPECIFIC RELATED HARMS
3A. SECTOR-SPECIFIC PRODUCTS: MARINE, AQUATIC AND TERRESTRIAL – MARINE/ AQUATIC – FISHING AND AQUACULTURE	Low	High	Moderate	High	High	High
	Designed to be used in direct contact with land/water. Not always designed for durability/repair, high propensity to get snagged/lost due to currents or other factors. High likelihood of entering the environment, but not all products will have transboundary impacts.			Commonly found in marine plastic litter globally. High tendency for breakdown and dispersal. Can continue to harm, trap and smother marine wildlife and habitats. High amounts of phthalates, some products primarily made from plastics using additives (e.g., PVC for soffits).		
3B. SECTOR-SPECIFIC PRODUCTS: MARINE, AQUATIC AND TERRESTRIAL – TERRESTRIAL – AGRICULTURE/ AGRICULTURAL PLASTICS APPLIED DIRECTLY	Low	High	Moderate	High	High	High
	Designed to be used in direct contact with land. High propensity to get lost in flooding events. Surface run-off and erosion can transport microplastics from fields to waterways.			Commonly found in land litter globally. Due to design, it can harm, trap, and smother wildlife. Microplastics can effect changes in soil physio-chemical properties which can have impacts such as reduced root growth or nutrient uptake.		
3C. SECTOR-SPECIFIC PRODUCTS - OTHER	High	Low	Low	Low	Low	High
	Products tend to be used in the home, less likely to end up in the environment. Risk of dumping if costs of disposal are high. Tend to be durable, heavy, difficult to blow away or float.			Not commonly found in litter. Little mobility in the environment, though some components and smaller products may still be mobile. Lower impact until broken down. PVC used in construction and household products releases harmful substances when incinerated – can leach into soils and groundwater. Several toxic additives are found in e.g., e-waste, and if leaked to the environment the harms are severe so impact is high[34].		

3.4 PRIMARY MICROPLASTICS

In contrast to secondary microplastics, from which the pathways to the environment and impacts once in the environment are linked to the use of specific plastic products, primary microplastics are a product in their own right. They are a key source of microplastic pollution, which is often due to their patterns of use, as well as physical properties. Being very small and lightweight, they are very mobile once released in the environment, and usually of a very low value compared with the final functions they perform. This means that they are unlikely to be recaptured once released. There are also no clear waste management pathways for these items, so the emphasis for any regulations needs to be on preventing their release in the first place. Once in the environment, they are commonly ingested by wildlife and tend to bioaccumulate in the food chain, with various negative impacts on wildlife health depending on the chemicals and substances they contain. Preproduction microplastics also tend to be poorly handled, with numerous reports of massive leakage incidents in the ocean due to container spills from cargo ships.[21, 22, 23]

Table 3-4: Assessment of plastic product groups: primary microplastics

PRIMARY MICROPLASTICS	PROBABILITY:			IMPACT:		
	VOLUME IN CIRCULATION	TENDENCY TO ENTER	TRANSBOUNDARY RELEVANCE	PREVALENCE	PHYSICAL PROPERTIES	SPECIFIC RELATED HARMS
4A. PRIMARY MICROPLASTICS: IN APPLICATION OR INTENTIONALLY ADDED MICROPLASTICS	Low	High	High	Moderate	Moderate	Moderate
	Application in direct contact with water. Lightweight, small, easily blown away and carried by water. Costly to capture with no subsequent use or recycling value.			Size means high likelihood of transboundary impact through migration through water systems.		
4B. PRIMARY MICROPLASTICS: PREPRODUCTION	Moderate	High	High	High	Moderate	Moderate
	Not all plastics in primary forms are in the form of pellets, though a large proportion of these are. In some cases, the tendency to enter is high (e.g., spills and improper handling of pellets in production settings). High cost of capture.			Additives, phthalates and BPA leach out of microplastics into the terrestrial and marine environment – risk higher than with microbeads as not applied directly to skin and hair.		



3.5. PRIORITIZING HIGH-RISK PLASTIC PRODUCT GROUPS

The above assessment results are aggregated to inform the prioritization of high-risk plastic product groups for urgent interventions. Product groups with high and moderate ratings against most criteria are deemed a higher priority issue than those with mostly moderate and low ratings. In addition, further logic tests ensure that appropriate weighting is given to specific criteria relative to others.

The pollution risks of product groups are assessed relative to one another and only in the current context. This means that product groups deemed to be of lower priority have relatively lower risks **only in comparison to the other product groups** in this assessment, and **only at the time of assessment**. Their pollution risk evaluation results should not be taken as an absolute value independent of context. Product groups not currently assessed as a priority may be reassessed as 'high-risk' in the future either as the availability of data and evidence improves, or once the priority product groups are sufficiently tackled (so their risk level is mitigated and reduced relative to current non-priority product groups).

The prioritization of high-risk plastic product groups, based on the assessment framework described in the preceding sections, is summarized in **Table 3-5**. The product groups deemed 'lower priority due to lower risk' are then excluded from the classification of Class I or Class II product groups in section 4.

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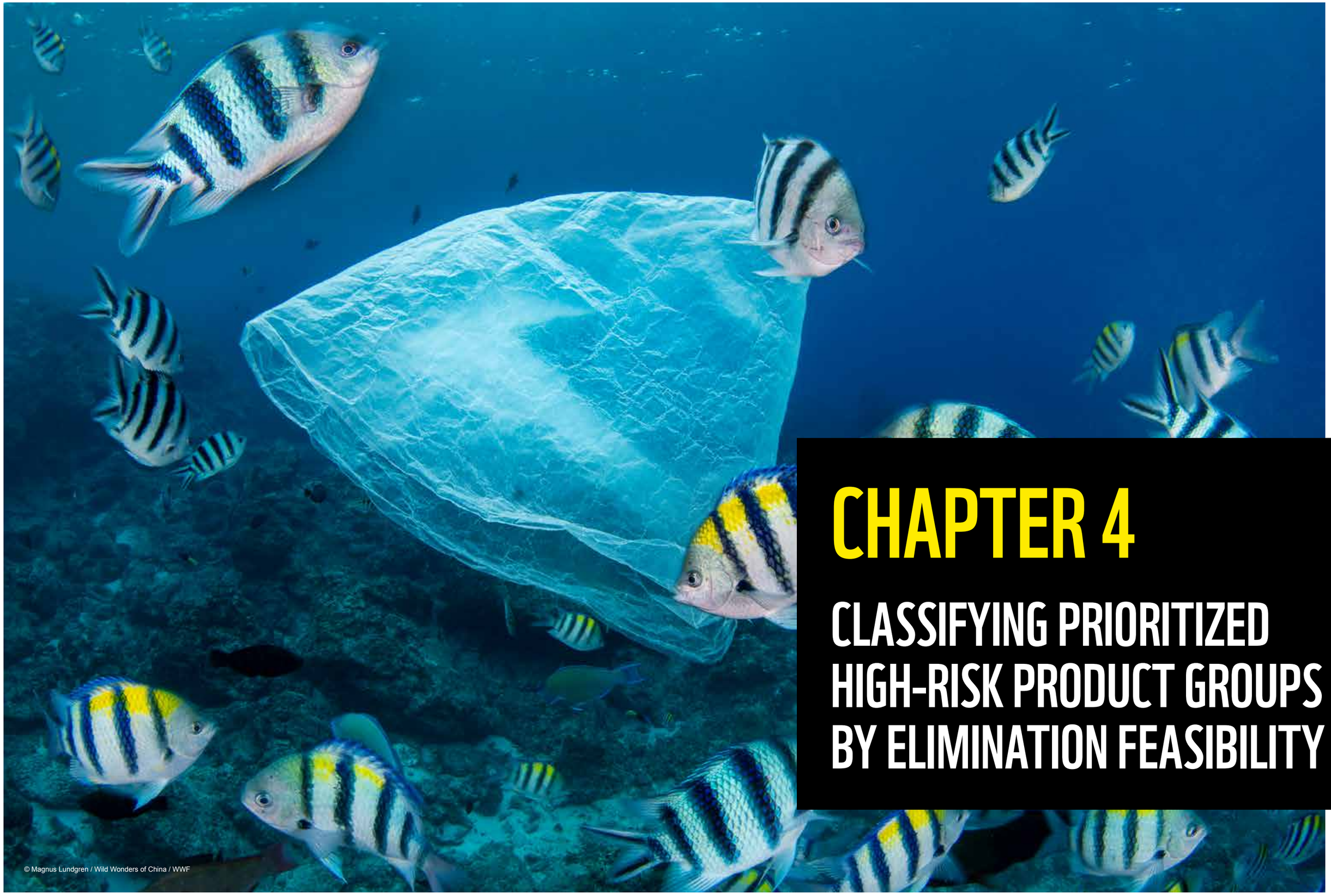
Table 3-5: Prioritization of high-risk plastic product groups

	PRODUCT GROUP	PRIORITY DUE TO HIGH POLLUTION RISK
Packaging	1a. Packaging: contact sensitive – single-use food and beverage (necessary/ other)	Yes
	1b. Packaging: contact sensitive – multi-use food and beverage	*Lower priority due to lower risk*
	1c. Packaging: contact sensitive – cosmetics and personal care (necessary/ other)	Yes
	1d. Packaging: contact sensitive – pharmaceutical and medical	Yes
	1e. Packaging: other contact sensitive	Yes
	1f. Packaging: non contact sensitive	Yes
Characteristic-specific products	2a. Characteristic-specific products: single-use short-lived – fibres/non-woven – necessary	Yes
	2b. Characteristic-specific products: Single-use short-lived – fibres/non-woven – other (non-necessary)	Yes
	2c. Characteristic-specific products: other single-use short-lived items – necessary	Yes
	2d. Characteristic-specific products: Other single-use short-lived items – Other (non-necessary)	Yes
	2e. Characteristic-specific products: Longer life – Cause significant secondary microplastic release	Yes
	2f. Characteristic-specific products: Longer life – Other longer life items	*Lower priority due to lower risk*
Sector-specific plastic products	3a. Sector-specific products: Marine, aquatic and terrestrial - Marine/Aquatic – fishing & aquaculture	Yes
	3b. Sector-specific products Marine, aquatic and terrestrial - Terrestrial - agriculture / Agricultural Plastics Applied Directly	Yes
	3c. Sector-specific products - Other	*Lower priority due to lower risk*
Primary microplastics	4a. Primary microplastics In application or intentionally added microplastics	Yes
	4b. Primary microplastics Preproduction	Yes

As can be seen, a majority of the product groups are assessed as high priority based on current evidence and understanding. In part this reflects the fact that during the iterative assessment process, further splits are made for some larger product groups, due to intermediate results that indicate the varied use patterns and pathways to the environment of different subgroups within the large grouping – which in turn would require measures to be more specifically tailored to the subgroups. For example, the packaging group alone is split into a total of six subgroups. Further splitting of this nature may also occur as treaty negotiations proceed. In contrast, the category of 'other' sector-specific products is kept broad in this assessment, because the results indicate that tailored measures for more specific subgroups are not urgently required. This category does however include products of various sectors, some of which (e.g., construction) have significantly more plastic usage by volume than others. Should the treaty seek to address this area in future, subdivision could help maintain focus on priority products.



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CHAPTER 4

CLASSIFYING PRIORITIZED HIGH-RISK PRODUCT GROUPS BY ELIMINATION FEASIBILITY

In this section, the product groups that are assessed as high risk and prioritized for urgent interventions – summarized in Table 3-5 – are divided into two distinct classes (Class I and Class II). This division is based on one principal criterion: whether or not it is considered feasible, in the near term, to eliminate or significantly reduce the consumption and production of these product groups. If not, the feasibility of safe circulation and management of these groups is assessed. A key premise for this analysis is that regulations aimed at eliminating a certain product category or application (e.g., through global bans and phase-out provisions) are, other things being equal, the most cost-efficient, proportional and implementable regulatory approach to minimizing plastic pollution.

As discussed in Section 1.2, this report anticipates that the treaty can determine the main control measures to tackle pollution caused by each product group by placing it into one of two classes.

- Class I encompasses plastics for which production, consumption and trade could be *either* eliminated *or* significantly reduced without major negative consequences. For this analysis, significant reduction or elimination *within the first decade of the treaty's life* (i.e., by or before around 2035) has been selected as the benchmark against which product groups are placed in Class I. There is scope for increasing the level of ambition over time, by moving entire product groups, or specific products, from Class II to Class I, or by increasing the level of reduction and shortening reduction timelines (phase-out schedules) for products in Class I.
- Class II encompasses product groups for which production, consumption and trade could not be directly and significantly reduced without major negative consequences at the time of assessment. For Class II, the treaty must improve safe and non-toxic circularity and – where disposal is unavoidable – ensure the final stage of the plastics chain minimizes or prevents products, or the plastics they contain, from contributing to pollution.

Across both Class I and Class II, the treaty should prioritize elimination, then reduction, then safe circulation, and only then safe management. This is discussed further in Report Two.

To determine the placement of identified high-risk product groups into Class I and Class II as described above, an assessment against another metric – the feasibility of controls – is conducted, using the following three criteria:

- Technical feasibility (e.g., the availability and viability of alternative materials or processes)
- Socioeconomic feasibility (e.g., the affordability and acceptability of changes, including differential impacts for specific countries or demographic groups)
- Likelihood of unintended consequences (e.g., the risks that substitution/reduction/management may have other high-risk or worse environmental outcomes).

TECHNICAL FEASIBILITY

This criterion seeks to examine whether it is currently technically feasible to tackle plastic pollution from a given product group, and encompasses a range of considerations:

- Class I
  - Can this product group be phased out/avoided?
  - Can the plastic in this product group be substantially reduced?
  - Are alternatives to plastics in the given product group available and accessible?
  - Do the alternatives fully meet the functional requirements of their plastic counterparts?
  - Are the alternatives readily scalable to meet demand by 2035?
  - Are policy solutions to enable a shift from plastics in these product groups to alternatives well demonstrated in any country at present?
- Class II
  - Do technologies to collect, recycle and reuse plastic waste from these product groups exist?
  - Are these readily scalable by 2035?
  - Are policy solutions to enable the environmentally sound management and safe circulation of plastics in these product groups well demonstrated?

according to the product group in question. This was important for product groups in which the plastic components of the product or application, rather than the product itself, are the subject of the treaty.

SOCIOECONOMIC FEASIBILITY

This criterion gauges whether tackling the pollution from a given plastic product group is likely to disproportionately affect certain demographic groups or communities, bearing in mind differing contexts within and between countries. In particular, countries face different challenges depending on per capita income[24] and infrastructure across several domains, from access to drinking water to waste management. Bans on certain items may also have a disproportionately negative effect on elderly people, disabled people or those with certain medical conditions.[25] Socioeconomic contexts may also disproportionately place the burden or costs associated with shifts to alternatives or changes in consumption on specific demographic groups. For example, shifting from single-use water bottles to reusable ones with refill systems requires access to potable water systems and infrastructure for reuse. Lower-income groups, or communities in areas with limited infrastructure access, may face disproportionate health and economic impacts from an abrupt shift.[26] In another case, the use of reusable nappies in place of disposable ones is workable in many contexts, but requires access to clean water and more often than not, due to prevailing gender norms, places the burden of labour associated with this change on women.

Consideration is therefore given to the risk that a control measure could reduce access to, or increase costs associated with, certain products and systems that might create or worsen health, hygiene or sanitation challenges, especially for those living in poverty or crisis situations. For example, for necessary non-woven products like single-use feminine sanitary products, the assessment takes into account the possible impacts of elimination of this product group in situations where access to clean water and privacy are limited.[27]

For Class II products, these considerations are also relevant for control measures around improved waste management. For example, where technical or financial barriers to improvement exist, the assessment also considers implications for informal waste sector workers in this context.

LIKELIHOOD OF UNINTENDED CONSEQUENCES

The solutions to plastic pollution are not likely to be environmentally neutral themselves. This is because the issues of environmental pollution and a lack of circularity in resource use are not limited to plastics alone. If the control measures around certain plastic product groups are not designed well, there is a risk of addressing one problem but giving rise to others.

For Class I products, this is related to the impacts of any alternatives that may arise, or be encouraged, to take the place of the plastic product that has been eliminated/reduced. For single-use plastic products, there is a significant risk that these will simply be replaced by single-use products made of other materials that may be as prone to littering and may have similar or worse impacts on the environment across their life cycles (across a wide range of measures from carbon emissions to land-use competition).[28] The underlying purpose of reducing or eliminating the harms generated by the plastic in question would not be met if this was to occur.

Similarly, an improvement in waste collection for Class II products would significantly reduce the probability of plastics entering the environment. However, it must be coupled with additional measures to ensure sound treatment options for the collected plastic waste so as to avoid the accumulation of waste in open dumps, or diversion to incineration, with associated greenhouse gas and toxic emissions.[29] The objective to safely manage and circulate plastics will not be met, and major negative environmental consequences would arise, if these measures are not taken in parallel.

4.1. ASSESSING THE FEASIBILITY OF ELIMINATING PRODUCT GROUPS

Each of the previously identified high-risk plastic product groups (see **Section 3.5**) is assessed against the feasibility criteria described above.

As with the assessment of high-risk plastic product groups, this assessment uses a three level system of low, medium and High feasibility. The results are summarized in the table below. Note that only prioritized high-risk product groups, as shown in **Table 3-5**, have been moved forward for further assessment.

Table 4-1: Packaging

PACKAGING GROUPS	FEASIBILITY FOR ELIMINATION		
	TECHNICAL FEASIBILITY	SOCIO-ECONOMIC FEASIBILITY	UNINTENDED ENVIRONMENTAL CONSEQUENCES
1A. PACKAGING: CONTACT SENSITIVE – SINGLE-USE FOOD AND BEVERAGE (NECESSARY/ OTHER)	Medium	Medium	Low
	Alternatives and technology available to eliminate or manage in some cases. Some well-tested policy options, mostly around increasing circularity. In some cases, alternatives and required technology are too expensive. Likely to cause undue burden in countries where packaging is essential for health and safety reasons. Policies to improve circularity are more widely acceptable. Risk that eliminating plastic in these applications will result in shift to other single-use alternatives with a similar/worse impact.		
1C. PACKAGING: CONTACT SENSITIVE – COSMETICS AND PERSONAL CARE (NECESSARY/ OTHER)	Medium	Medium	Low
	Alternatives and technology to eliminate or manage available in some cases but not all. Lack of well-tested policy options, though some evidence of emerging policies around reuse models. Likely to cause undue burden in countries where plastic is used for safety reasons. Some alternatives such as glass deemed unsafe for some personal care products. Alternatives likely to be too expensive in some cases and increased expense likely to affect low-income groups disproportionately. Risk of shift to other single-use alternatives with a similar or worse impact.		
1D. PACKAGING: CONTACT SENSITIVE – PHARMACEUTICAL AND MEDICAL	Low	Medium	Low
	Alternatives available to eliminate for some, but not the majority. Lack of well-tested policy options. Likely to cause additional burden in low-income countries where plastic is used for health and safety reasons. Some emerging policies to improve circularity through reusable solutions. Risk that eliminating plastic in these applications will result in shift to other single-use alternatives with similar or worse impact.		
1E. PACKAGING: OTHER CONTACT SENSITIVE	Low	Medium	Low
	Alternatives and technology available to eliminate or manage in some cases but not all. Lack of well-tested policy options. Policies to improve circularity are more widely acceptable. Likely to cause undue burden in countries where plastic is used for health and safety reasons. Risk that eliminating plastic in these applications will result in shift to other single-use alternatives with similar/worse impact.		
1F. PACKAGING: NON CONTACT SENSITIVE	Medium	Medium	Low
	Alternatives and technology to eliminate available in some cases but not others. Some well tested policy options for circulating specific products. Dependent on specific products but elimination likely to result in higher cost of products, placing undue burden on some groups. Reduction likely to be lower risk. Risk that eliminating plastic could result in shift to similar or worse alternatives. Risk of creating a void in the market if plastic use is banned with alternatives not yet commercially or technically viable.		

*Note: refer to **Section 3.0** for explanation of "necessary / other" packaging subgroup.

4.1.1. Packaging

Given the widespread applications, compositions and functions of plastics in packaging, and the sensitivity of some use cases (for example, medical and pharmaceutical), it is not likely that any of the packaging product groups can be eliminated *in their entirety* within the first 10 years of the treaty.

However, significant *reductions* in single-use packaging within some product groups should be achievable, justifying the inclusion of these groups in Class I.[30] There are a small number of cases where particular packaging products could be targeted within a product group, but there is also extensive scope for standards to eliminate unnecessary applications of specific packaging formats, and optimize material use even in cases where packaging is still required.

There are also very significant opportunities to improve circulation and management of these packaging subgroups to reduce plastic pollution and ensuing harms under Class II. This is likely to include reducing complexity in materials and substances used, since not all types of packaging are designed to be collected, sorted and recycled. The use of recycled content needs to increase, and the economic viability of recycling needs to improve. Global requirements and standards can help drive these changes. Some Class II measures may also indirectly help drive overall reductions in use (for example in the case of reuse).

Packaging is a complex and high-risk category, and greater differentiation of ambition both between and within its subgroups should be a negotiation priority, to ensure ambition is maximized and control measures complement each other to optimize outcomes. This is further described in Report Two.

4.1.2. Characteristic-specific products

In considering elimination of single-use plastic products, the risk of substitution and unintended consequences was deemed high, as it is not only plastic but the widespread use of single-use products that creates environmental harm.

Careful consideration was given to the distribution of impacts associated with eliminating plastics in items necessary for human health and hygiene; this was a key driver in defining the 'necessary' category in the first place. For example, switching from disposable nappies that contain plastics to reusable ones is theoretically feasible in many settings, but is likely to have a disproportionate impact on women, due to prevailing social norms of childcare duties.[31] Reusable nappies also require good access to clean water for washing, and may be more expensive than single-use counterparts, which will disadvantage those affected by poverty or crisis.

For longer-life products that release secondary microplastics during use, eliminating plastic use is not assessed as feasible in the next 10 years. The focus is therefore on the feasibility of reducing microplastic leakage through improved design standards and strategies to capture these microplastics. In relation to the problem of textile waste and leakages here, measures to secure safe circulation and management, such as extended producer responsibility, are deemed highly feasible.

4.1.3. Sector-specific products

There is insufficient evidence on what reduced use of plastic products, or plastic in products, would need to look like for fishing gear and aquaculture. The vast majority of actual and proposed interventions on plastic pollution for these product groups focus on preventing dumping of gear, and ensuring fishing gear is retrieved and recycled.[32] Likewise, there is insufficient evidence on the feasibility of large-scale alternatives to agricultural plastics, with actual or proposed interventions focused on retrieval of material, and a possible case for design changes to reduce harms when material is left in the environment. The feasibility assessment therefore leads to a focus on Class II controls for these product groups, discussed further in Report Two.

4.1.4. Primary microplastics

The feasibility assessment shows the use of intentionally added microplastics in some applications is suitable for elimination (e.g., microbeads in rinse-off cosmetics, which have already been successfully regulated in some countries). Where intentionally added microplastics are not eliminated, this is largely due to costs associated with alternatives, rather than a lack of suitable alternatives or negative impacts on humans and the environment.[33] Elimination is likely to become feasible within the next decade and regulation is likely to play a key role in ensuring suitable alternatives are scaled up sufficiently to enable this.

Preproduction plastics, on the other hand, cannot be eliminated as a product group, as this

Table 4-2: Characteristic-specific products

CHARACTERISTIC-SPECIFIC PRODUCTS GROUPS	FEASIBILITY FOR ELIMINATION		
	TECHNICAL FEASIBILITY	SOCIO-ECONOMIC FEASIBILITY	UNINTENDED ENVIRONMENTAL CONSEQUENCES
2A. CHARACTERISTIC-SPECIFIC PRODUCTS: SINGLE-USE SHORT-LIVED - FIBRES/NON-WOVEN – NECESSARY	Low	Low	Low
	Alternatives available, though not rolled out at scale or not proven suitable for every context. Waste management systems are lacking. No well-tested policy options. Likely to adversely affect some groups due to expense/inconvenience/ lack of clean water associated with alternatives. Also considered necessary for health/hygiene. Alternatives do not have a clear end-of-life route for circulation at present – environmental impacts of production may be higher in some cases.		
2B. CHARACTERISTIC-SPECIFIC PRODUCTS: SINGLE-USE SHORT-LIVED – FIBRES/ NON-WOVEN – OTHER (NON-NECESSARY)	High	High	High
	Alternatives available or use of plastic in items unnecessary. Waste management technology is currently lacking in some cases. Some evidence of policy options. Unlikely to cause problems if eliminated. In those that can't be eliminated, there will be a need for multi-use alternatives and standards surrounding these.		
2C. CHARACTERISTIC-SPECIFIC PRODUCTS: OTHER SINGLE-USE SHORT-LIVED ITEMS – NECESSARY	Low	Medium	Medium
	Some alternatives available but not all. Waste management technology available in some cases. Policy options tend not to be tested. In some cases, alternatives and required technology are too expensive. Any cost burden would be felt disproportionately by some groups as items are essential.		
2D. CHARACTERISTIC-SPECIFIC PRODUCTS: OTHER SINGLE-USE SHORT-LIVED ITEMS – OTHER (NON-NECESSARY)	High	High	High
	Alternatives available or items/uses of plastic in items unnecessary. Waste management technology is currently lacking in some cases. Some evidence of policy options. As items are not necessary, they are unlikely to cause issues from elimination. In those that can't be eliminated, there is a need for multi-use alternatives and standards surrounding these.		
2E. CHARACTERISTIC-SPECIFIC PRODUCTS: LONGER LIFE – CAUSE SIGNIFICANT SECONDARY MICROPLASTIC RELEASE	Low	Low	Medium
	Alternatives lacking. Some technology available to capture microplastic release. Some evidence of policy options to reduce leakage/circulate which are also related to increasing durability of the products. Increased short-term costs of products could disproportionately affect low-income groups. Technology roll-out likely to be expensive.		

Table 4-3: Sector-specific products

SECTOR-SPECIFIC PRODUCT GROUPS	FEASIBILITY FOR ELIMINATION		
	TECHNICAL FEASIBILITY	SOCIO-ECONOMIC FEASIBILITY	UNINTENDED ENVIRONMENTAL CONSEQUENCES
3A. SECTOR-SPECIFIC PRODUCTS: MARINE, AQUATIC AND TERRESTRIAL – MARINE/AQUATIC – FISHING AND AQUACULTURE	Medium	Low	Medium
	Elimination likely to be costly/unfeasible. Alternatives lacking, though some suggestions for improved design and durability available. Some waste management technologies available but not at scale. Some evidence of policy options. Some risk of measures increasing short-term costs of products, disproportionately affecting low-income groups. Technology roll-out likely to be expensive. Fishing is likely to involve some losses of equipment to the sea given the challenging operating context.		
3B. SECTOR-SPECIFIC PRODUCTS: MARINE, AQUATIC AND TERRESTRIAL – TERRESTRIAL – AGRICULTURE/ AGRICULTURAL PLASTICS APPLIED DIRECTLY	Medium	Low	Medium
	Some alternatives available. Most policy options focused on reducing leakage and improving circularity. Some risk of measures increasing short-term costs of products which would disproportionately affect low-income groups. Technology roll-out likely to be expensive.		

Table 4-4: Primary microplastics

PRIMARY MICROPLASTICS GROUPS	FEASIBILITY FOR ELIMINATION		
	TECHNICAL FEASIBILITY	SOCIO-ECONOMIC FEASIBILITY	UNINTENDED ENVIRONMENTAL CONSEQUENCES
4A. PRIMARY MICROPLASTICS: IN APPLICATION OR INTENTIONALLY ADDED MICROPLASTICS	High	High	High
	Elimination feasible and alternatives unnecessary. Wastewater treatment works available but disproportionate. Policy options tested. Unlikely to cause problems if eliminated, as applications are non-essential.		
4B. PRIMARY MICROPLASTICS: PREPRODUCTION	Low	Medium	Low
	Alternatives lacking and have high-risk of unintended environmental consequences (e.g., if alternative material substitutes for plastic have a higher overall environmental footprint over their lifecycle). Technology/ policies for prevention of leakage do exist and are in use in some cases. Reducing risk of leakage/safe management is highly feasible.		

would imply eliminating the majority of plastics. The feasibility assessment is therefore focused on reducing leakage of these items, though a possible indirect impact of eliminating other plastic products is an overall reduction in the amount of preproduction plastics used. Linked to this are control measures on reducing all plastic production.

4.2. CLASS I AND CLASS II PLASTIC PRODUCT GROUPS

The classification of prioritized high-risk plastic product groups is summarized in the table below. Class I product groups are those that could be eliminated or reduced within the first decade, and Class II product groups are those where controls on safe circulation and management are needed to reduce plastic pollution and the harms it causes. Class II control measures may have the added benefit of reducing overall plastic use and reducing harms from Class I product groups during their phase-out period. Report Two discusses the relevant control measures in detail.

Where a product group is in both Class I and Class II, the hierarchy of eliminate – reduce – safely circulate – safely manage should always be followed. It is however expected that measures across the plastics value chain will in combination drive the overall change at the required speed and scale.

As evidence improves, and as control measures change the nature and extent of plastic use, it is likely that more products could be eliminated, following the 'start then strengthen' approach to regulation. Nothing should prevent individual countries or groups of countries exceeding the rate of change required by the global treaty, and potentially demonstrating what is possible.

Four areas were borderline cases for inclusion in Class I at present. In packaging, pharmaceutical and medical packaging is not prioritized for Class I controls due to sensitivities around use, while for other contact-sensitive packaging, this is due to a lack of evidence on the potential consequences. However, a case could be made that some Class I controls may prove suitable for these product groups. Equally, sectoral applications of plastic for fishing and aquaculture and for farming are not prioritized for elimination (Class I) as most evidence of actual or potential control measures focuses on retrieval of plastic from the environment, collection for recycling, safe disposal, or minimizing harm when plastic does remain in the environment, all of which fall under Class II. There is clearly scope for additional research on how to reduce plastic use in these sectors without impacting the actual activities of fishing or farming.

Table 4-5: Classification of high-risk plastic product groups into Class I and II

PRODUCT GROUP		CLASS I	CLASS II
PACKAGING	1a. Packaging: contact sensitive - single-use food and beverage (necessary/other)	☑	☑
	1b. Packaging: contact sensitive – multi-use food and beverage	*Not currently assessed as a priority high-risk plastic product group*	
	1c. Packaging: contact sensitive – cosmetics and personal care (necessary/other)	☑	☑
	1d. Packaging: contact sensitive – pharmaceutical and medical		☑
	1e. Packaging: other contact sensitive		☑
	1f. Packaging: non contact sensitive	☑	☑
CHARACTERISTIC-SPECIFIC PRODUCTS	2a. Characteristic-specific products: single-use short-lived – fibres/non-woven – necessary		☑
	2b. Characteristic-specific products: single-use short-lived – fibres/non-woven – other (non-necessary)	☑	
	2c. Characteristic-specific products: other single-use short-lived items – necessary	☑	☑
	2d. Characteristic-specific products: other single-use short-lived items – other (non-necessary)	☑	
	2e. Characteristic-specific products: longer life – cause significant secondary microplastic release	☑	☑
	2f. Characteristic-specific products: longer life – other longer life items	*Not currently assessed as a priority high-risk plastic product group*	
SECTOR-SPECIFIC PLASTIC PRODUCTS	3a. Sector-specific plastic products: marine, aquatic and terrestrial – marine/aquatic – fishing and aquaculture		☑
	3b. Sector-specific plastic products: marine, aquatic and terrestrial – terrestrial – agriculture/ agricultural plastics applied directly		☑
	3c. Sector-specific plastic products: other	*Not currently assessed as a priority high-risk plastic product group*	
PRIMARY MICROPLASTICS	4a. Primary microplastics: in application or intentionally added microplastics	☑	
	4b. Primary microplastics: preproduction		☑

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CHAPTER 5

CONCLUSIONS AND NEXT STEPS

This report is the first of two reports setting out how negotiators should address product-specific controls in a legally binding international instrument to end plastic pollution. Controls of this type may not be the only feature of the treaty, but they must be a core component.

This report proposes both an analytical and a regulatory framework for determining what needs regulating and how this can be done. It identifies priority product groups for regulation based on their pollution risks, and the feasibility of tackling these products via elimination and reduction strategies (placing them in Class I) or strategies to ensure safe circulation and disposal (Class II).

It shows that:

- The desired outcomes of regulation should follow a hierarchy that prioritizes elimination, then reduction, then safe circulation, and then safe disposal.
- A product group approach, placing together a range of plastic products with similar risk features and suitability for regulation, is the best way to enable negotiators to think about the full range of plastic products that may be in scope for global controls. The product group approach still allows scope for negotiators to additionally regulate specific products within groups, or further subdivide groups where this adds value over time.
- A risk-based analysis of these product groups shows that certain products are greater contributors to plastic pollution than others and must be the immediate priority for regulation.
- A feasibility assessment showed that not all product groups can currently be eliminated or significantly reduced without consequences, meaning some high-priority product groups are only suitable for Class II controls at present.
- The prioritization and assessment framework used here can be reapplied in future if the evidence relating to risks or feasibility for existing product groups changes, or if additional product groups are separated out for more detailed regulation.

Table 5-1 shows which product groups are subject to Class I controls only (elimination is possible), which are subject to combined Class I and Class II controls (significant reductions are possible, but controls to improve safe circulation and management will still be needed in the meantime), and which, currently, can only be confidently recommended for Class II controls.

Report Two develops the classification and categorization undertaken here further by identifying potential control measures that can be included in the treaty and matching these to both Class I and Class II objectives, as well as to specific product groups.

Table 5-1: Product groups by type of product control considered most suitable

PRODUCT GROUPS RECOMMENDED FOR CLASS I CONTROLS ONLY	EXAMPLE PRODUCTS
• 2b. Characteristic-specific products: single-use short-lived – fibres/ non-woven – other (non-necessary)	• Wet wipes, cigarette butts, disposable vacuum filters, plastic tea bags
• 2d. Characteristic-specific products: other single-use short-lived items – other (non-necessary)	• Plastic balloons, cutlery/plates/cups, ear bud sticks, disposable e-cigarettes
• 4a. Primary microplastics: in application or intentionally added microplastics	• Microbeads in personal care products, antifouling application on ship hulls, microplastics used in industrial applications, microplastic coatings surrounding fertilizer granules
PRODUCT GROUPS RECOMMENDED FOR BOTH CLASS I AND CLASS II CONTROLS	**EXAMPLE PRODUCTS**
• 1a. Packaging: contact sensitive – single-use food and beverage (necessary/other)	• Toothpaste tubes, perfume spray bottles, shampoo and soap bottles, pots and tubs of creams, lotions and scrubs, lipstick and mascara tubes
• 1c. Packaging: contact sensitive – cosmetics and personal care (necessary and other)	• Toothpaste tubes, perfume spray bottles, shampoo and soap bottles, pots and tubs of creams, lotions and scrubs, lipstick and mascara tubes, etc.
• 1f. Packaging: non contact sensitive	• Packaging for household goods, stationery, electronics, plastic carrier bags, etc., including secondary or shipping/transport packaging
• 2c. Characteristic-specific products: other single-use short-lived items – necessary	• Some absorbent hygiene products (e.g., nappies, sanitary pads, incontinence pads, tampons), PPE, filters in engineering systems
• 2e. Characteristic-specific products: longer life – cause significant secondary microplastic release	• Tyres, synthetic textiles, paint
PRODUCT GROUPS RECOMMENDED FOR CLASS II CONTROLS	**EXAMPLE PRODUCTS**
• 1d. Packaging: contact sensitive – pharmaceutical and medical	• Medication bottles, blister packs for pills, protective casings and inserts for medical devices, IV bags, test tubes
• 1e. Packaging: other contact sensitive	• Packaging for animal feed, veterinary devices, children's toys, hazardous products
• 2a. Characteristic-specific products: single-use short-lived – fibres/ non-woven – necessary	• Some absorbent hygiene products (e.g., nappies, sanitary pads, incontinence pads, tampons), PPE, filters in engineering systems
• 3a. Sector-specific plastic products: marine, aquatic and terrestrial – marine/aquatic – fishing and aquaculture	• Nets, lines, pots and trawls, plastic mesh, PVC piping, fish aggregating devices (FADs)
• 3b. Sector-specific plastic products: marine, aquatic and terrestrial – terrestrial – agriculture/agricultural plastics applied directly	• Mulch film, plastic silage wrap, greenhouse tunnels
• 4b. Primary microplastics: preproduction	• Plastic resin pellets, flakes or powders

APPENDIX: PRODUCT GROUPS - DESCRIPTIONS AND EXAMPLES

PACKAGING

Plastic packaging as described here refers to plastic products that are used to contain, protect, handle, deliver and present goods at all points of the value chain, i.e., from raw materials to finished goods, and from the producer to the user or consumer. Products in this group may be made wholly of plastic materials, or of plastic used in combination with other materials. The tables below detail the groups and subgroups and give some key examples in each.

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Table 6-1: Packaging Group - descriptions and examples

PACKAGING SUB-GROUP 1	SUB-GROUP 2 & 3	EXAMPLES
Contact-sensitive Packaging whose design, production, storage or use may result in the migration of substances to the packaged product, such that the properties of the product may be altered negatively and pose risk to consumer health. Such packaging is therefore usually subject to strict quality controls and standards. Contact sensitive is defined in many national regulations, typically in relation to human health and safety rather than on packaging sustainability.[35] [36]	**1 a. Single-use food and beverage (necessary/ other)** Single-use plastic packaging is present throughout the food and beverage service value chain from production to consumption. This type of packaging is intended to be used once before being thrown away	Beverage bottles, takeaway containers, crisp packets, sachets and pouches, nets and wraps for fruit and vegetables, very lightweight plastic carrier bags used as primary packaging for loose food items,[37] EPS fish boxes.
	1b. Multi-use food and beverage Packaging for food and beverages that are specifically designed and placed on the market to accomplish multiple cycles of use throughout their lifetime, through being refilled or reused for the same original purpose. These products are often heavier and more durable than their single-use counterparts so they can be washed, refilled or reused many times without degradation. In other contact-sensitive applications, reusable packaging is currently rare, so no separate category is listed, but similar considerations apply in those contexts as for food and beverages.	Reusable beverage bottles, containers and cups
	1c. Cosmetics and personal care (necessary/ other) Plastic packaging for cosmetics and personal care products that are contact sensitive since they come into direct contact with human skin, hair, nails or teeth and may be ingested. There is frequently more variety and less consistency in packaging in this category than in food and beverage packaging.	Toothpaste tubes, perfume spray bottles, shampoo and soap bottles, pots and tubs of creams, lotions and scrubs, beauty products like lipstick and mascara tubes
	1d. Pharmaceuticals and medical Plastic packaging used for pharmaceuticals and for medical purposes that are contact sensitive since they come into contact with products that are ingested or administered for medical reasons, or that need to be sterile for medical purposes.	Medication bottles, blister packs for pills, protective casings and inserts for medical devices, IV bags, test tubes
	1e. Other contact sensitive Plastic packaging that is used in contact-sensitive applications that have not been listed above.	Packaging for animal feed, veterinary devices, children's toys, hazardous products
1f. Non-contact sensitive This category describes packaging which is not considered to be contact sensitive at the time of assessment. The focus of this category is on single-use applications in these contexts.		Packaging for products not listed above – household goods, stationery, electronics, plastic carrier bags, etc., including secondary or shipping/ transport packaging

CHARACTERISTIC-SPECIFIC PRODUCTS

This product group includes specific plastic items which are not packaging, and which are not grouped according to sectoral application. The rationale for grouping a range of non-packaging single-use items in the current analysis is driven by their prominence in the available evidence on the sources of plastic pollution. The need for this wider category was therefore arrived at inductively, with subgroups created to allow for logical and consistent controls based on composition or likely pathway to becoming plastic pollution. Further subgroupings were then developed to reflect the fact that some items within these groups may be less feasible to regulate at the current time.

Table 6-2: Specific Plastic Items – descriptions and examples

CHARACTERISTIC-SPECIFIC PRODUCTS SUBGROUP 1	SUB-GROUP 2	SUB-GROUP 3	EXAMPLES
Single-use short-lived items Single-use and short-lived are used to describe plastic items that are designed and produced to be used once, or for a short period of time, before being thrown away. This sub-group includes both products that are made wholly of plastic materials, as well as the plastic components of certain products that may be manufactured using other materials.	**Fibres/non-woven** Single-use, short-lived items that are made of non-woven plastic fibres, bonded together by treatment to provide specific functions such as absorbency, stretchiness, softness, strength, flame retardancy, washability, filtration and other functions. Many of these uses are essential for medical or technical purposes and have limited substitutability due to either material or use-case constraints, meaning that, even where alternatives are available, mandating reduced use at international level is not appropriate. Others do not carry out an essential function and their use could be reduced without negative implications for wider society.	2a. Necessary	Some absorbent hygiene products (e.g., nappies, sanitary pads, incontinence pads, tampons), PPE, filters in engineering systems
		2b. Other	Wet wipes, cigarette butts, disposable vacuum filters, plastic tea bags
	Other single-use short-lived items Non-packaging plastic items which are single-use or short-lived and are not made of non-woven fibres (i.e., more conventional rigid or flexible plastics). In some cases, these items may be considered necessary, due to their specific application or lack of suitable alternatives. However, many others do not carry out an essential function and the use-cases are for less socially sensitive applications.	2c. Necessary	Contact lenses, bin bags, plastic PPE
		2d. Other	Plastic balloons, cutlery/plates/cups, ear bud sticks, disposable e-cigarettes
Longer-life items Longer-life plastic products are designed to be more robust and durable and have a longer lifetime than their single-use and short-lived counterparts. They are often more valuable and used many times over the course of their lifetime and can be subject to wear and tear or degradation. In some items, this can lead to the release of microplastics – tiny plastic particles up to 5mm in diameter.	**2e. Those causing significant secondary microplastic pollution** Products which are both subject to degradation during their use phase, and where large-scale shedding of microplastics is driven by the way these products are used. Two products of specific concern have been identified at this stage: (1) car tyres, which lose material intensively due to wear and tear during the use phase, causing tyre dust; and (2) synthetic textiles, which release microfibres during use and more importantly during washing, as well as being a growing waste problem. Further products of concern may well be identified in future as relevant to this category.		Tyres, synthetic textiles
	2f. Other longer-life items Longer-lived plastic products which are not associated with significant microplastic release, or other well-recognized and widespread forms of plastic pollution, at the time of assessment. Such products are often made of multiple materials, of which plastic may only be one. If regulation turns to these products during negotiations or in future, there is a case for separating this product group out further.		Furniture, white goods, durable toys

SECTOR-SPECIFIC PRODUCTS

This category includes all plastic applications which are used in a specific sector. This group was chosen to reflect the fact that the use patterns of products in certain sectors are a key factor in resulting plastic pollution. This means that, depending on the sector, a significant proportion of products are used or disposed of directly in or close to sensitive ecosystems – including aquatic, marine and terrestrial environments.

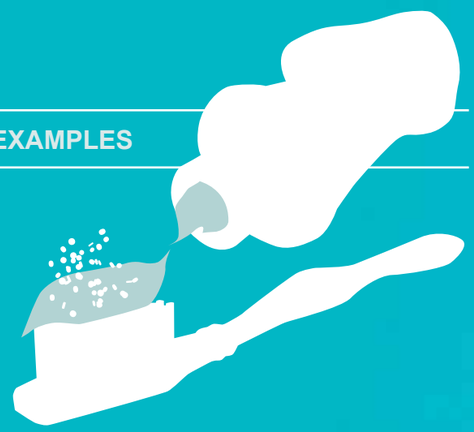
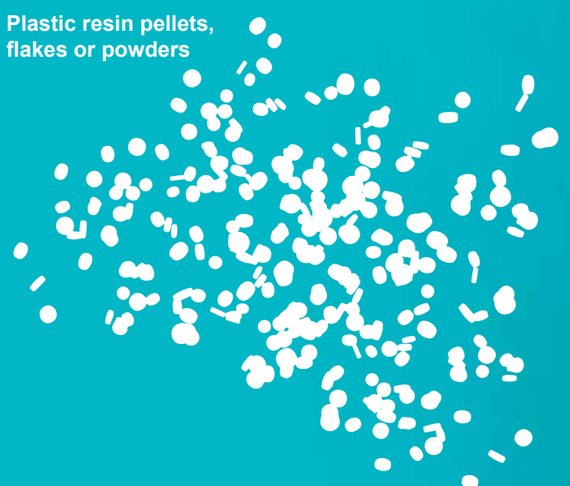
Table 6-3: Sector-wide Plastics – descriptions and examples

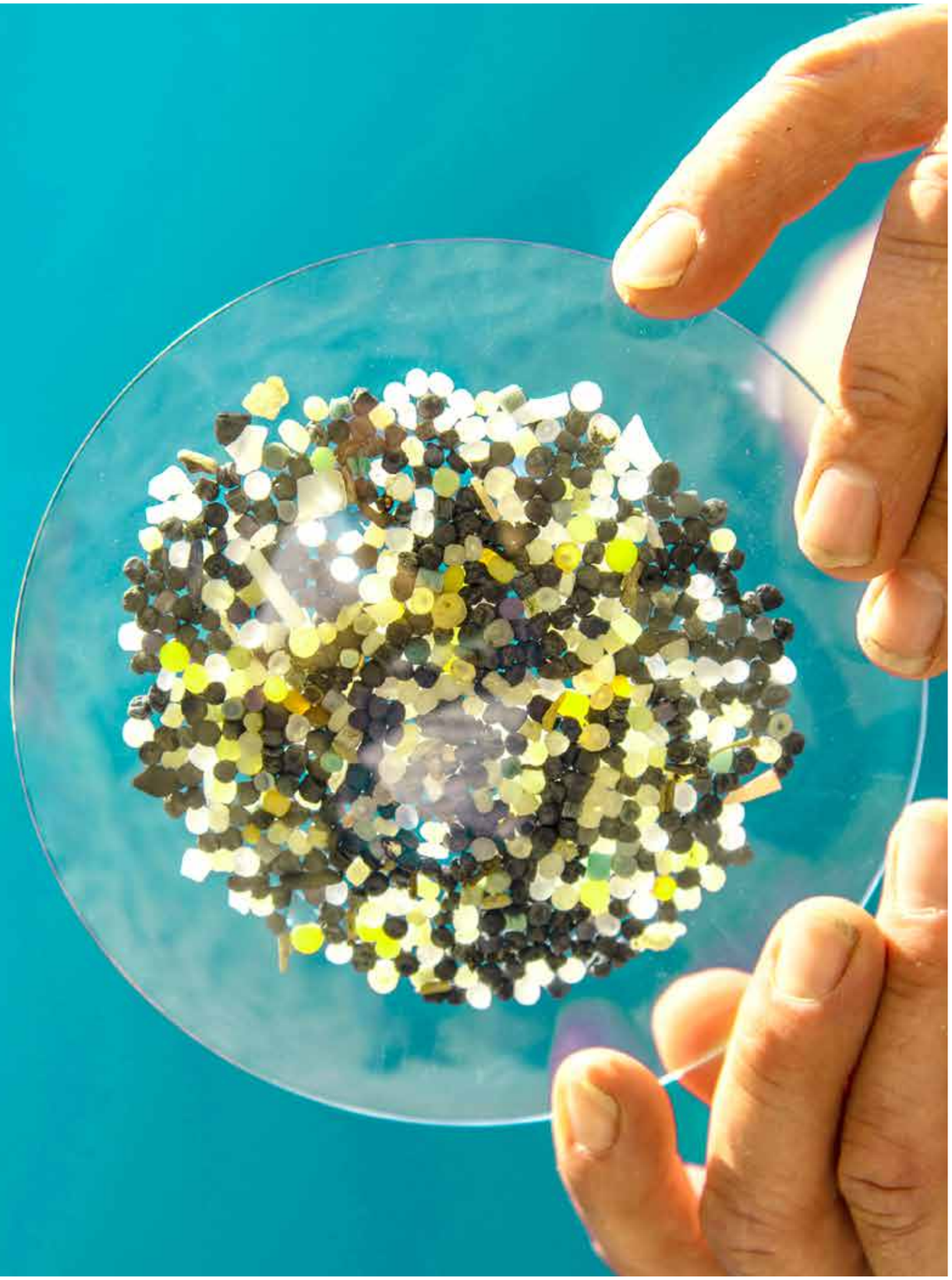
SECTOR-SPECIFIC PRODUCTS SUBGROUP 1	SUB-GROUP 2	EXAMPLES
Marine, aquatic and terrestrial These plastic applications are used or disposed of directly in or near marine, freshwater and terrestrial ecosystems. This means these categories are particularly environmentally sensitive and should be assessed independently from plastic products used in other sectors which do not, by design, come into direct contact with sensitive ecosystems. Two sectors have initially been identified as the highest concern in this area.	**3a. Marine and aquatic fishing and aquaculture** Plastic products used in the fishing and aquaculture industries specifically, with a particular focus on plastics in abandoned, lost and discarded fishing and aquaculture gear. These products are used not only in seas, but inland waterways as well. They pose a high escape risk, and als o pose unique environmental dangers when they do leak due to their nature and intended use.	Nets, lines, pots and trawls, plastic mesh, PVC piping, fish aggregating devices (FADs)[38]
	3b. Agriculture plastics applied directly Plastic products used directly in the terrestrial environment, specifically agricultural applications such as films (for polytunnels, silage, ground cover) which come into direct contact with land and soil. Escape is likely, as is degradation into microplastics, and these products are deployed directly on land and in soil, or near to waterways. This category excludes other plastics used in farming (e.g., packaging, microplastics in fertilizer) which are covered elsewhere.	Mulch film, plastic silage wrap, greenhouse tunnels [39]
3c. Other These are plastic products used in specific sectors that are not currently considered high risk for the purpose of this assessment, which focuses on the risks of plastic pollution. Products that are not designed to be directly used in or end up disposed of in environmental mediums, which have lon ger use-spans (and thus are less urgent to tackle to slow the flow of waste leaking into the environment), and which have product attributes (such as weight) that make them less mobile if they do leak mean these are considered less environmentally sensitive. This is a view based on concerns around plastic pollution – some of these products, such as waste electronic and electrical equipment (WEEE) , cause very real environmental policy challenges during production and disposal. If regulation turns to these products during negotiations or in future, there is a case for separating this product group out further.		Electrical/electronic equipment, construction materials, automotive components, household products

PRIMARY MICROPLASTICS

Microplastics are tiny plastic particles up to 5mm in size and may be of irregular shape. Primary microplastics differ from secondary microplastics as they are manufactured for use in plastic products (sometimes referred to as preproduction plastics) or for intentional addition to plastic or non-plastic products (e.g., microbeads in cosmetics, industrial abrasives and paints, etc.). These are distinguishable from secondary microplastics, which arise from the fragmentation of larger plastic items over time.

Table 6-4: Primary Microplastics

PRIMARY MICROPLASTICS SUB-GROUP 1	EXAMPLES
4A. IN APPLICATION OR INTENTIONALLY ADDED MICROPLASTICS **This category describes microplastics which originate from products where they have been deliberately included as a component (or intentionally added).** **Microplastics are frequently included in personal care products and detergents and are not usually filtered out during sewage treatment, meaning they reach waterways directly even where treatment systems are in place. Other applications include more technical settings such as industrial abrasives, marine paints and coatings, polishing agents, etc. where there is little or no chance of interception between use and the wider environment.**	 **Microbeads in personal care products such as toothpastes, skin care and scrubs; antifouling application on ship hulls; microplastics used in industrial applications such as printer inks, spray paints, injection mouldings and abrasives; microplastic coatings surrounding fertilizer granules**
4B. PREPRODUCTION **This category describes plastic pellets, flakes and powders (sometimes called nurdles) used as feedstock in the manufacture of finished plastic products. They are typically spherical or cylindrical and small in size. They are usually manufactured by petrochemical companies before being transported to manufacturers and compounders/converters before a finished plastic article is produced. This means that they are widely handled and transported, and due to their small size, prone to spillage at each of these handling points. Where this occurs, these items are highly mobile and individually of very low value, and therefore unlikely to be retrieved before they enter the environment.**	**Plastic resin pellets, flakes or powders** 



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Endnotes

1 United Nations Environment Programme, 'Glossary of Terms for Negotiators of Multilateral Environmental Agreements' (January 2007), https://www.unep.org/resources/report/glossary-terms-negotiators-multilateral-environmental-agreements

2 United Nations Environment Programme & Basel Convention, 'Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal' (1989), p. 17, https://www.unep.org/resources/report/basel-convention-control-transboundary-movements-hazardous-wastes

3 United Nations Environment Programme, 'The Montreal Protocol on Substances that Deplete the Ozone Layer' (1992), Fourth Meeting of the Parties of Montreal Protocol, Decision IV/25: Essential uses,

4 United Nations Environment Programme, 'Compilation of United Nations Environment Assembly resolutions on marine litter and microplastics' (2019), p. 4, https://wedocs.unep.org/handle/20.500.11822/32238

5 United Nations, 'Protocol on Pollutant Release and Transfer Registers to the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Kyiv Protocol)' (2003), p. 4, https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVII-13-a&chapter=27&clang=_en

6 United Nations Environment Programme, 'Amendment to the annex of the Protocol of 1978 Relating to the International Convention for the Prevention of Pollution from Ships' (2011), p. 3, https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/MEPCDocuments/MEPC.201(62).pdf

7 United Nations Environment Programme & Basel Convention, 'Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal' (1989), p. 17, https://www.unep.org/resources/report/basel-convention-control-transboundary-movements-hazardous-wastes

8 Cowan E & Tiller R., 'What Shall We Do With a Sea of Plastics? A Systematic Literature Review on How to Pave the Road Toward a Global Comprehensive Plastic Governance Agreement' (2021), https://www.frontiersin.org/articles/10.3389/fmars.2021.798534/full

9 WWF, 'Towards a Treaty to End Plastic Pollution: Global Rules to Solve a Global Problem' (2022), https://wwfint.awsassets.panda.org/downloads/towards_a_treaty_to_end_plastic_pollution___final_report.pdf

10 The European Union, 'Potential options for elements towards an international legally binding instrument by the co-chairs of the High Ambition Coalition to End Plastic Pollution' (2023), p. 2, https://wedocs.unep.org/bitstream/handle/20.500.11822/41793/EUsubmission.pdf?sequence=1&isAllowed=y

11 Federal Department of the Environment, Transport, Energy and Communications Switzerland, 'Potential options for elements towards an international legally binding instrument' (2023), p. 4 https://wedocs.unep.org/bitstream/handle/20.500.11822/41830/Switzerlandsubmission.pdf?sequence=1&isAllowed=y

12 United Nations Environment Programme & Stockholm Convention, 'Stockholm Convention on Persistent Organic Pollutants' (2019), http://chm.pops.int/Portals/0/download.aspx?d=UNEP-POPS-COP-CONVTEXT-2021.English.pdf

13 United Nations Environment Programme & Basel Convention, 'Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal' (2019), http://www.basel.int/Portals/4/download.aspx?d=UNEP-CHW-IMPL-CONVTEXT.English.pdf

14 UNEP, Basel Convention, Draft updated technical guidelines for the identification and environmentally sound management (ESM) of plastic wastes and for their disposal (version of June 2021), http://www.basel.int/Implementation/Plasticwaste/Technicalguidelines/Draftoftechnicalguidelines(versionJun2021)/tabid/8881/Default.aspx

15 Original figure from WWF, 2022[A]. Source: PEW and SYSTEMIQ, 2020[B]; Note: Volume of plastic fishing gear production is indicative only given lack of reliable global estimates. Absolute volume of fishing gear 'leaked' follows previous WWF estimated ranges, while acknowledging some sources find significantly higher proportions of fishing gear in marine samples (~80% of the Great Pacific Garbage Patch, The Ocean Cleanup Project, 2022[C]).

A. WWF, Towards a treaty to end plastic pollution (2022), https://wwfint.awsassets.panda.org/downloads/towards_a_treaty_to_end_plastic_pollution___final_report.pdf
B. PEW and SYSTEMIQ, 'Breaking the Plastic Wave' (2020), https://www.pewtrusts.org/-/media/%20assets/2020/10/breakingtheplasticwave_mainreport.pdf
C. The Ocean CleanUp, 'The Other Source: Where does plastic in the Great Pacific Garbage Patch really come from?' (2022), https://youtu.be/CQnMjYlmNyQ

16 It is important to note, however, that very lightweight plastic carrier bags are used in some cases as packaging for non-food items

17 Other plastic products used in the fishing industry (floats, product storage) are not such a direct focus, though initiatives to tackle plastics in the sector may also address these where appropriate.

18 Other plastic products used in agriculture such as containers, storage tanks etc. are not such a direct focus as they are of less immediate concern to the risks focused on by this report.

19 Water UK, 'Wipes in Sewer Blockage Study' (2017), pp. 3, https://www.water.org.uk/wp-content/uploads/2018/11/Wipes-in-sewer-blockage-study.pdf

20 IUCN & Boucher, D. & Friot, D., 'Primary microplastics in the oceans' (2017), pp. 9, https://portals.iucn.org/library/node/46622

21 Willsher K, 'France to take legal action over 'nightmare' plastic pellet spill' (2023), https://www.annalsofglobalhealth.org/articles/10.5334/aogh.4056/

22 Baker S, Campbell M, Tanakasempipat P, 'Inside Big Plastic's Faltering 1.5 Billion Global Cleanup Effort' (2022), https://www.bloomberg.com/features/2022-exxon-mobil-plastic-waste-cleanup-greenwashing/

23 South African Maritime Safety Authority, 'Three year nurdles mess clean-up draws to an end; SAMSA' (2021), https://blog.samsa.org.za/2021/03/29/three-year-nurdles-mess-clean-up-drawns-to-an-end-samsa/

24 Lema K, 'Slave to sachets: How poverty worsens the plastics crisis in the Philippines' (2019), https://www.reuters.com/article/us-asia-waste-philippines-idUSKCN1VO0G3

25 Jenks A, Obringer K, 'The poverty of plastics bans: Environmentalism's win is a loss for disabled people' (2020), Critical Social Policy vol. 40(1): pp. 151–161, https://journals.sagepub.com/doi/pdf/10.1177/0261018319868362

26 Harvey F. 'Improve water supply in poorer nations to cut plastic use, say experts' (2020), https://www.theguardian.com/environment/2020/may/27/improve-water-supply-in-poorer-nations-to-cut-plastic-use-say-experts

27 Circular, 'Tackling single-use and social stigma in period management' (2021),), https://www.circularonline.co.uk/features/tackling-single-use-and-social-stigma-in-period-management/

28 The Pew Charitable Trusts, SYSTEMIQ, 'Breaking the Plastic Wave: A Comprehensive Assessment of Pathways Towards Stopping Ocean Plastic Pollution' (2020), pp. 55-61, https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave_report.pdf

29 Doyle A, 'Plastic mines? Europe struggles as pollution piles up' (2018), https://www.reuters.com/article/us-environment-plastics-insight-idUSKBN1ICoFY

30 Way C, 'Healthcare is still hooked on single-use plastic PPE, but there are more sustainable options' (2020), https://theconversation.com/healthcare-is-still-hooked-on-single-use-plastic-ppe-but-there-are-more-sustainable-options-143940

31 Buckingham S, Kulcur R, 'Gendered Geographies of Environmental Injustice' (2009), Antipode vol. 41: pp. 659–683, https://bura.brunel.ac.uk/bitstream/2438/8822/1/Fulltext.pdf

32 Scott K, 'We have international laws to stop plastic pollution from fishing vessels now. Why are we not enforcing them?' (2022), https://theconversation.com/we-have-international-laws-to-stop-plastic-pollution-from-fishing-vessels-now-why-are-we-not-enforcing-them-185951

33 Plastic Soup Foundation, 'EU Ban on Microplastics in Cosmetics: Too Slow and Too Limited' (2023), https://www.plasticsoupfoundation.org/en/2023/03/eu-ban-on-microplastics-in-cosmetics-too-slow-and-too-limited/

34 Landrigan et al., 'The Minderoo-Monaco Commission on Plastics and Human Health' (2023),), https://www.annalsofglobalhealth.org/articles/10.5334/aogh.4056/

35 European Commission, 'Food Contact Materials' (n.d.), https://food.ec.europa.eu/safety/chemical-safety/food-contact-materials_en

36 US Food & Drug Administration, 'Packaging & Food Contact Substances' (2021), https://www.fda.gov/food/food-ingredients-packaging/packaging-food-contact-substances-fcs

37 It is important to note, however, that very lightweight plastic carrier bags are used in some cases as packaging for non-food items.

38 Other plastic products used in the fishing industry (floats, product storage) are not such a direct focus, though initiatives to tackle plastics in the sector may also address these where appropriate.

39 Other plastic products used in agriculture such as containers, storage tanks etc. are not such a direct focus as they are of less immediate concern to the risks focused on by this report.

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