BACKGROUND INFORMATION FOR INTERACTIVE TECHNICAL BRIEFING 12 AUGUST 2020: PRESENTATION OF CASE STUDIES ON THE ANALYSIS OF EFFECTIVENESS OF EXISTING AND POTENTIAL RESPONSE OPTIONS AND ACTIVITIES IN CONTRIBUTING TOWARDS LONG-TERM ELIMINATION OF DISCHARGE OF MARINE PLASTIC LITTER AND MICROPLASTICS INTO THE OCEANS.

# Developing a methodology to analyse the effectiveness of existing and potential response options and activities on marine litter and microplastics

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# 1 PURPOSE OF THIS DOCUMENT

Document UNEP/AHEG/2020/4/4 titled "A revised methodology to analyse the effectiveness of existing and potential response options and activities on marine litter and microplastics at all levels to determine the contribution in solving the global problem" outlined two approaches for the analysis of response options to the global issue of marine litter and microplastics. These approaches are based on the Bowtie analysis and a set of indicators to analyse process, input and performance.

This document contributes to the understanding of the revised methodology to analyse the effectiveness of existing and potential response options and activities. To achieve this, the study firstly outlines a framework against which the response options are analysed. Three pilot studies are presented that apply the methodology. These pilot studies analyse regional marine litter action plans, a new international framework and a management strategy to prevent microplastics within the framework to illustrate application of the methodology. Suggested response options at the international, regional and national levels are suggested for further analysis, as presented in an online intersessional webinar on 18th May 2020.

# 2 A FRAMEWORK FOR THE ANALYSIS

The response options and activities identified for analysis are presented as an archetype, or a typical model, of a management strategy towards addressing the global issue of marine litter and microplastics. These management strategies are existing or potential and would operate at the international, regional or national levels. The management strategies selected are listed in Table 1, illustrating that management strategies may be complementary to each other, while functioning as components of an overarching 'umbrella' management strategy.

*Table 1: Relationship between management strategies to be assessed*

| | **Complementary management strategies** | **Umbrella management strategies** |
|---|---|---|
| **International** | • Strengthen & enhance implementation of existing global instruments<br>• Global design standards | • A new harmonised global framework - PILOT |
| **Regional** | • Regional marine litter action plans - PILOT | • Strengthen & enhance implementation of existing regional instruments |
| **National** | • Regulatory measures (SUP bans)<br>• PCR supply (MBI)<br>• PCR demand (MBI)<br>• Microplastics – PILOT<br>• Sustainable waste management | • National action plans |

The relationship between management strategies at the international, regional and national levels is further illustrated in Figure 1.

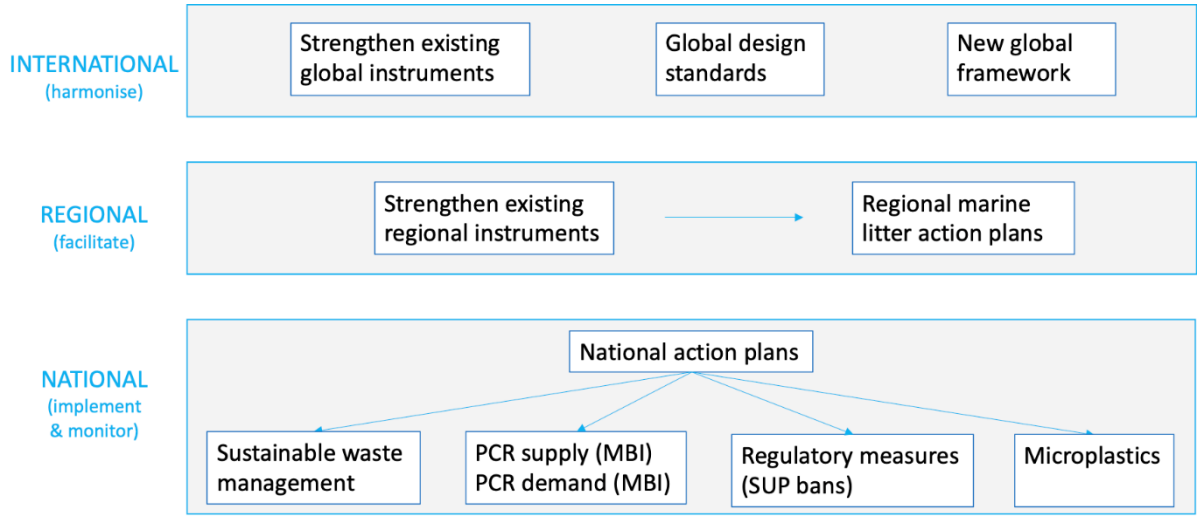


*Figure 1: Illustration of the relationship between management strategies*

As requested by member states and major groups and stakeholders in submissions for the methodology for analysis, the response options should be assessed within context of what each aims to achieve. A hierarchy has therefore been developed for the purposes of this study to guide the determination of the context and therefore the measures of effectiveness or key performance indicators (KPIs).

The identification of indicators for determining effectiveness in achieving the intended goal of a management strategy can be based on the expected role of a management strategy as well as the level at which it operates. Thus a hierarchy exists, providing an relationship between the levels.

Figure 1 illustrates the hierarchy of marine litter response options and activities, providing a first-level context categorisation of a global, regional or national level:

1. At the global level, the primary aim is to **harmonise** efforts and reporting to enable global tracking of progress towards the long-term goal of elimination of discharge into the marine environment.
2. At the regional level, the focus would be **facilitate** national action towards achieving the global goal by providing the tools to catalyse and further harmonise national implementation.
3. At the national level, the primary focus is on **implementation** with a strong focus on monitoring the impacts and reporting the results to inform regional and global reporting.

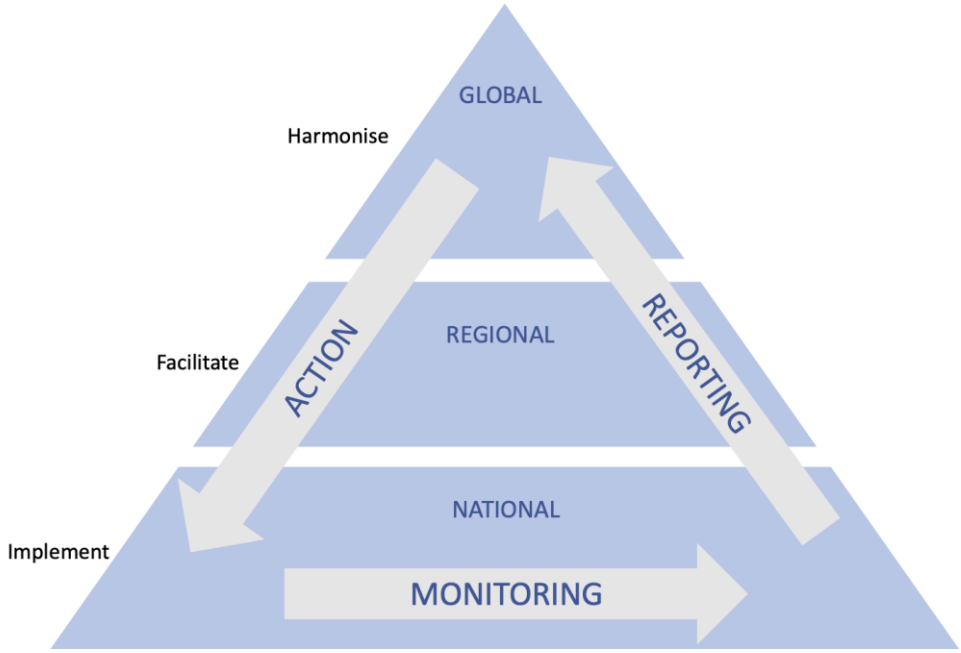


*Figure 2: The hierarchy of marine litter response options and activities*

Thus, a top-down flow for action of "harmonization – facilitation – implementation" can be envisaged. Simultaneously, a bottom-up flow for reporting would follow, with national reporting of monitoring results being aggregated at the regional level, which in turn, is aggregated at the global level.

The overarching goal of each management strategy will be influenced by the level at which it operates. Table 1 reflects the high-level primary roles of management strategies at the different levels. This will, in part, determine the measures of effectiveness for the management strategy and therefore its contribution in solving the global problem.

*Table 2: High-level primary roles of management strategies at the international, regional and national levels*

| **International** | **Regional** | **National** |
|---|---|---|
| Harmonise action:<br>• global objectives<br>• cooperation & capacity building<br>• track & report progress towards global goals | Facilitate action:<br>• guidance & knowledge building<br>• monitoring methodologies<br>• cooperation & capacity building<br>• track & report progress at the regional level | Implement activities:<br>• national targets<br>• national policy & regulation<br>• monitoring<br>• track & report progress at the national level |

The study makes a distinction between operational controls and management controls. As explained by Cormier, *et al*:

> "Operational controls are the prevention, mitigation, and recovery controls needed to manage the pressures and impacts resulting from human activities and the demands on natural ecosystem services. Management controls are the processes needed to ensure that the operational controls are implemented across relevant jurisdictions and sectors in consultation with stakeholders." (Cormier et al., 2018).

The analysis of the archetype management strategies therefore takes a two-pronged approach. The operational controls are firstly analysed using the **Bowtie analysis**, whereas the management controls are analysed using a set of **indicators** developed together with submissions made by member states and major groups and stakeholders for the draft methodology. The latter indicators analysis provides insight into the enabling factors that support the likelihood of success of the operational controls.

In other words, the analysis of the operational controls using the Bowtie analysis considers what is, or could, be done to prevent waste and microplastics leaking into the environment, whereas the indicators analysis considers the inclusion of management controls to ensure the success of the operational activities.

## 2.1 Bowtie Analysis

Analysing the effectiveness of a broad range of response options and activities requires moving beyond the traditional cause-effect model that predominantly monitors pollution in the marine and coastal zones and setting KPIs against these impacts, as illustrated in Figure 2. Multiple pressures contribute to the leakage of wastes into the environment and multiple response controls can be implemented to manage the issue. A typical management strategy, or an archetype, can be modelled using the Bowtie analysis by providing a method for identifying the causes of leakage and the controls that can reduce the risk and the effect of those causes.


*Figure 3: Illustration of the traditional cause-effect model*

Member states and major groups and stakeholders requested that the study acknowledge multi-disciplinary & cross-sectoral nature of combating plastic pollution across full life cycle and that the DPSIR (drivers, pressure, state, impact and response) model is integrated. These can be reflected in through the Bowtie analysis, which recognises that a single policy response operates within and parallel to multiple factors, making it difficult to attribute a reduction of accumulation to a single response (Ekardt, 2019). The Bowtie analysis[1] provides a method to assess the risk of response options being ineffective in preventing the discharge of marine litter and microplastics to the oceans by analysing potential events that may result in the leakage of plastics into the environment. There are multiple causes for such discharge to the oceans and the Bowtie analysis relates these causes to a central undesirable event that can lead to multiple consequences (Cormier et al., 2016).

The consequences of leakage into the environment are the accumulation of plastics in multiple environmental compartments. This accumulation then has further environmental and socio-economic consequences. By evaluating the effectiveness of controls, gaps can also be identified, providing opportunity for revision of existing controls or the introduction of new controls, as illustrated in Figure 4.

Each pilot management strategy is presented in the five sections. The first provides a scope of the management strategy, followed by an outline of the context of the management strategy within the

[1] For more on the application of the Bowtie analysis refer to Cormier, R., Elliot, M., Kannen, A., 2018. *IEC/ISO Bowtie analysis of marine legislation: A case study of the Marine Strategy Framework Directive*. ICES Cooperative Research Report No. 342, 56. https://doi.org/10.17895/ices.pub.4504; and Astles, K.L., Cormier, R., 2018. *Implementing Sustainably Managed Fisheries Using Ecological Risk Assessment and Bowtie Analysis*. 10. 10.3390/su10103659

policy hierarchy, as outlined above. The third section presents the findings of the Bowtie analysis, providing an overall Bowtie diagram of the operational controls appropriate to the management strategy. These are elaborated in a description of the controls and barriers in each of the four life cycle phases, followed by the controls appropriate to post-event leakage situations. The fourth section presents the findings of the analysis of the management controls assessed across a common set of indicators, including the performance indicators. The final section provides a brief conclusion of the contribution of the management strategy to solving the global issue of pollution by marine litter and microplastics.

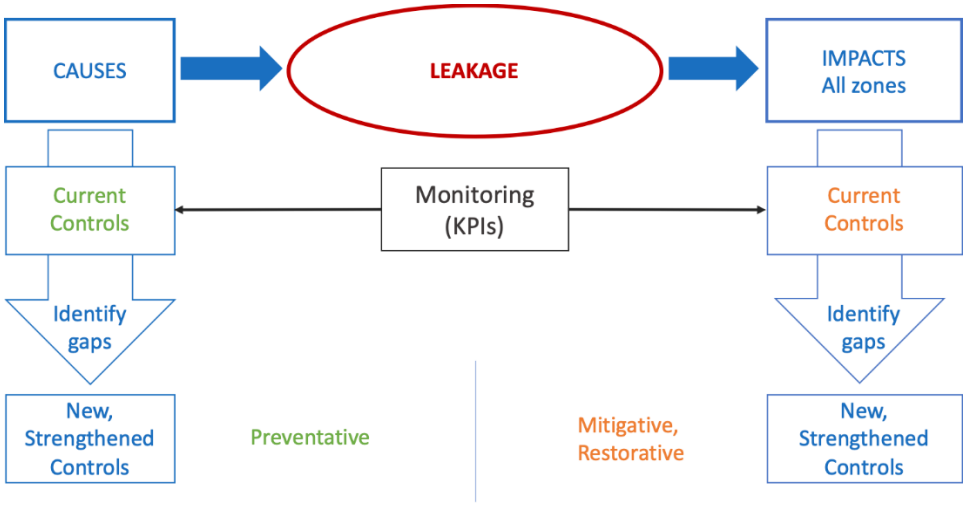


*Figure 4: Overview of the objective of the Bowtie analysis*[2]

At the centre of the Bowtie is the **primary event to be avoided**, which can also set the threshold of acceptance for such an event. For this study, a level of acceptable pollution to the environment is set at zero, aiming for zero leakage to any environmental compartment (sea, freshwater, soil and air).

Figure 5 provides a simplified version of the above flow of events for a single life cycle phase, introducing the risk that barriers may present to the achievement of leakage elimination.

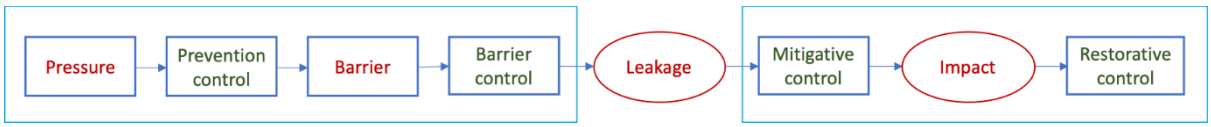


*Figure 5: Illustration of the pressure-impact flow within the Bowtie analysis*

**A.** On the left of the Bowtie, are the **causes of risk** (or sources). These can lead to the undesirable event of leakage of plastics into the environment and the causes are therefore also the areas of opportunity for change to reduce the risk of leakage. For the purposes of this study, the causes are related to the four primary life cycle phases of plastics, where source activities can be grouped and where the pathways for marine litter originate. These are:

1. Source materials
2. Product manufacture

[2] Adapted from broadleaf.com.au/resource-material/bow-tie-analysis

3. Use
4. End-of-life.

**B.** The **pressures** are the stressors or reasons for the leakage taking place. This could lead to the acceptable threshold of pollution being exceeded.

**C. Preventive controls** (responses or activities) aim to reduce the effect of the pressure on the central event that is to be avoided. These are *preventive controls* if undertaken prior to the event taking place.

**D. Barriers** can reduce the effectiveness of control measures (preventive, mitigative or restorative) and can include lack of government awareness or industry resistance to regulations. These factors usually take place outside of the governance strategy.

**E. Barrier controls** can be put in place to limit the effect of barriers, which are outside of the management strategy and can therefore be difficult to monitor for effectiveness towards achieving the management targets. Barrier controls can themselves be monitored for effectiveness.

**F. Mitigative controls** would be implemented post leakage, but prior to accumulation in these zones. Examples include wastewater treatment plants that capture microplastics before being released to the environment.

**G.** I**mpacts** are the consequences of control measures failing to prevent the undesirable event of plastic leakage from taking place. The consequences of this leakage are the accumulation of plastics in the environment. For the purposes of this study, these accumulations zones have been categorised to align with policy response options into:

- Dumps,
- Waterways and coastal zones,
- Sewers and stormwater systems,
- Soil,
- Air,
- Maritime zones from direct sources.

**H. Restorative controls** are actions that aim to reduce the impact of accumulation of marine litter and microplastics. These include sustainable removal of activities and the disposal thereof.

**I. Monitoring and evaluation** activities are used to validate the effectiveness of control measures undertaken within the management strategy against the defined management and operational targets. They should assess the effectiveness of preventive controls as well as mitigative and restorative controls, i.e. activities that take place on both 'sides' of the Bowtie analysis. The actual outputs and outcomes are compared to the targeted outputs and outcomes. Outputs and outcomes may be qualitative and/or quantitative and may include environmental impacts, legislative changes, information collation and dissemination, as well as various capacity building activities.

The *cumulative effect* of all pressures and the failure of preventive controls to eliminate the leakage of plastics into the environment will require *mitigative* or *restorative* controls to be taken to reduce the impact of leakage on the marine environment. Where the number of controls on the left of the Bowtie are greater than the mitigative or restorative controls on the right, the management strategy can be considered preventive in nature (Cormier et al., 2016).

## 2.2 Analysis of the management controls

As described above, management controls (activities) improve the likelihood of success of the operational controls. Combining the submissions from member states and major groups and stakeholders, three groups of management controls were identified that relate to **process**, **input** and **impact**. The indicators selected will remain constant across all archetypes identified for this study.

*Table 3: Indicators for analysis of management controls*

| Indicator Type | Indicator | Description |
|---|---|---|
| INPUT | Scope | International, regional or national |
| | Maturity | Operational years - high, medium, low |
| | Scale | Level of adoption |
| PROCESS | Governance | Management targets<br>Operational targets |
| | Management | Local capacity building<br>Ongoing funding secured<br>Monitoring in place<br>Reporting in place<br>Review process defined |
| | Co-operation | Domestic stakeholder inclusion<br>International capacity building |
| | Co-benefits | Environmental<br>Social<br>Economic |
| PERFORMANCE | Outputs | Relative to the role of the management strategy |
| | Outcomes | |

## 2.3 Possible additional areas of analysis

A greater level of risk assessment can be included in the Bowtie analysis. This could include the following:

1. the likelihood of an escalating factor influencing the effectiveness of preventive, mitigative and restorative controls,
2. the level of risk,
3. the potential exposure, or
4. the consequences thereof.

Environmental risk assessment can be combined with the Bowtie analysis (Astles and Cormier, 2018) to strengthen the evaluation of effectiveness of controls. It is also possible to overlay a cost-benefit analysis for management controls to provide an assessment of cost-effectiveness. These are both likely to vary greatly between countries and regions. Environmental risk assessment and economic cost-effectiveness analysis have not been included in the study, but may be helpful in the future, particularly at the national and sub-national level.

**Quantification of effectiveness** is possible for some controls, e.g. number of countries that have adopted container deposit/return schemes. For a comprehensive level of quantification to be conducted, the Bowtie analysis would benefit from pathways that are independent, coupled with estimation of the probabilities of events taking place along each pathway and an estimation of the

likelihood that particular controls would fail. This is more relevant in complex situations where independence between pathways and barriers is not clear.[3]

# 3 PILOT 1: REGIONAL MARINE LITTER ACTION PLANS (RAPs)

## 3.1 Scope of the pilot

A selection of regional marine litter action plans (RAPs) adopted under the UN Regional Seas Programme were reviewed, focusing on land-based sources of marine litter. The regions included are:

1. Baltic Sea,
2. Mediterranean,
3. Pacific,
4. East Asia Seas,
5. West Indian Ocean, and
6. North-East Atlantic.

Additional regional marine litter action plans developed under the UN Regional Seas Programme as well as regional economic fora will be included in the complete analysis to be undertaken. These will include other categories of measures, such as ocean-based sources and microplastics.

## 3.2 Regional marine litter action plans in context

Regional bodies that aim to address the issue of marine litter and microplastics should provide guidance to member states and a framework for regional cooperation (OSPAR Commission, 2014). The primary role of such a regional body is therefore to facilitate action at the national level.

The role of RAPs is to facilitate action at the national level through:

- developing and implementing appropriate policy, legal instruments and institutional arrangements,
- enhancing knowledge on impacts to marine ecosystems and public health and safety,
- providing guidance to improve monitoring of quantities and distribution of marine litter and microplastics,
- providing guidance and enhancing knowledge on prevention and reduction actions, including upstream interventions,
- building on existing regional and national policy and regulatory frameworks,
- fostering greater implementation and stronger enforcement of existing frameworks,
- identifying policy gaps and recommending further development of policy and regulatory frameworks,
- identifying issue-specific sources of marine litter and microplastics and providing tools to better manage these sources,
- providing resources for targeted sectors to enhance application of BEPs,
- providing resources for community awareness and education,

[3] http://broadleaf.com.au/resource-material/bow-tie-analysis/

- monitoring and promoting research and investigation to better define key problem areas and allow for adaptation,
- monitoring and assessing progress at the regional level
- building cooperative environment for stakeholder engagement.

These facilitative actions apply to land- and sea-based sources as well as litter and microplastics that are already present in the marine environment.

The roles identified above have been used to guide the identification of pressures and controls, as well as outputs and outcomes, within the Bowtie Analysis of the RAP archetype.

## 3.3 Findings of Bowtie Analysis

The Bowtie for RAPs has been developed using measures adopted in regional marine litter action plans. These measures have been grouped into the life cycle phases they can influence and then further categorised into pressures, prevention controls, barriers, barrier controls, mitigative controls and restorative controls, as reflected in Figure 6.

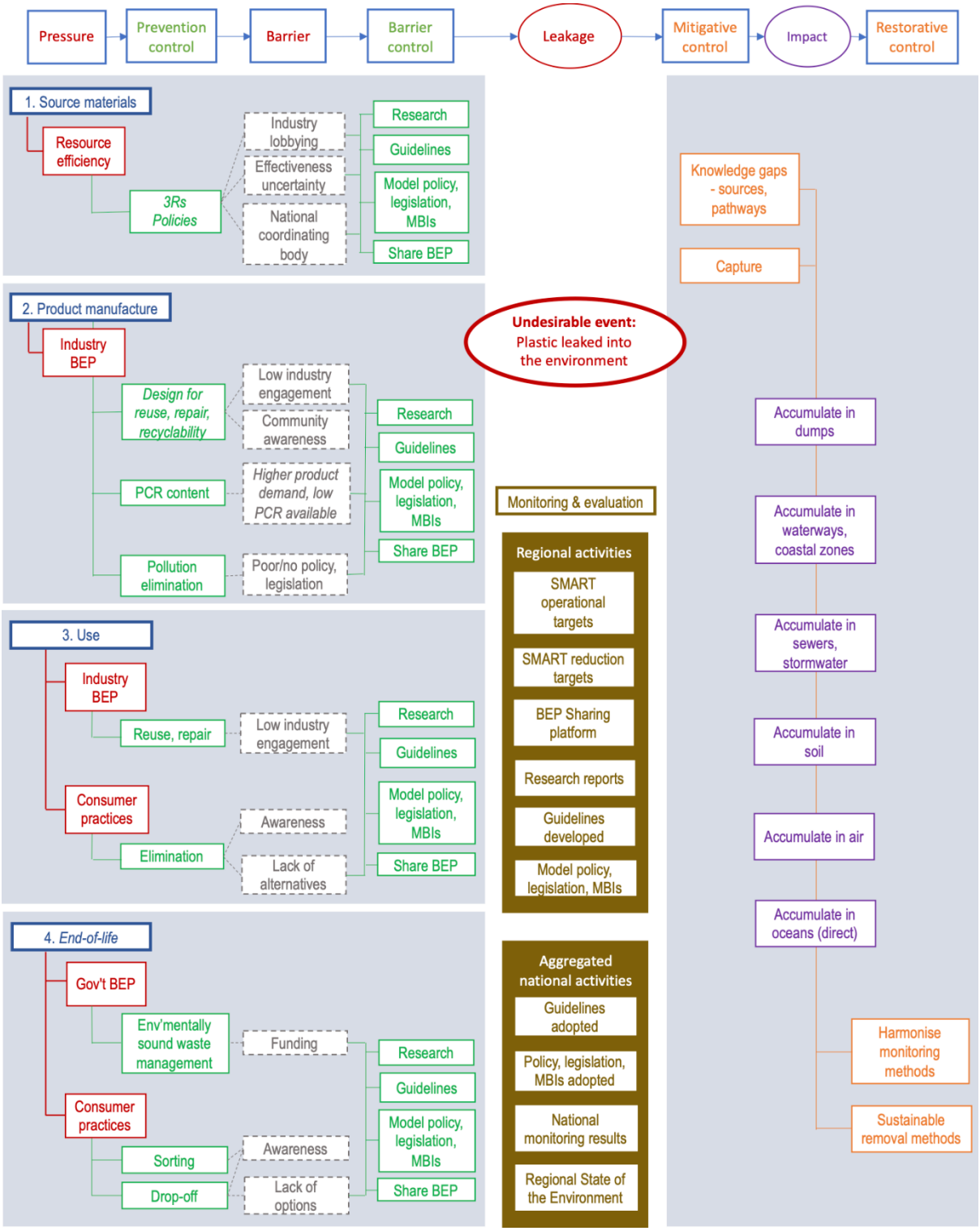


*Figure 6: Bowtie Diagram of the management strategy for regional action plans for marine litter*

## 3.3.1 Life Cycle Phase 1: Source Materials

### 3.3.1.1 Pressure – Low resource efficiency

It is recognised that policies to improving resource efficiency can contribute to combatting marine litter (OECD, 2019a). The pressure identified within the RAP management strategy relevant to the source materials life cycle phase is poor practices resulting in low **resource efficiency** outcomes.

Controls that improve resource efficiency of plastics can reduce the use of renewable resources (e.g. water) and non-renewable resources (e.g. oil, natural gas). In addition, the release of greenhouse gases can be reduced across the life cycle phases (CIEL, 2019a; OECD, 2019a).

The 3R approach includes strategies to stimulate:

- **reduction**, such as bans, differential taxes and use of alternatives,
- **reuse**, possibly supported by return schemes, and
- **recycling** processes that use end-of-life products to manufacture new plastics.

#### 3.3.1.2 Prevention control – Policies to incentivise 3Rs

A focus of many RAPs is the promotion of relevant policy and regulatory frameworks (Pacific), particularly the development of national action plans (NAPs) in the form of 1) marine litter action plans, or 2) waste management action plans that incorporate marine litter prevention and reduction measures. Where extreme weather events are common, 3) disaster management plans are also promoted. In particular, the application of the **3R waste hierarchy** (reduce, reuse, recycle) is prioritised. Reduction at source, particularly through urban solid waste management, can be assisted by applying the waste hierarchy (UNEP/MAP, 2013). The development of **model legislation** is suggested to assist countries in assessing the relevance and adoption within their national context (SPREP, 2018a).

#### 3.3.1.3 Barriers

The reduction strategies included within the 3R approach can include the banning of certain products from national markets. This will affect importers and domestic producers of those products. **Industry lobbying**, particularly if employment by these sectors is at risk, can influence the decision and timing for such bans.

Information on the effectiveness of national policies and legislation can be difficult to obtain if these instruments are not designed to use relevant and measurable operational and reduction targets. **Uncertainty of the effectiveness** of policy and legislative responses, particularly market-based instruments (MBIs), the cost-effectiveness of interventions and the prevention of unintended consequences, can lead to adoption of weaker policy and regulatory frameworks at the national level.

Implementing the 3Rs approach can take cooperation between many government agencies. RAPs have promoted the establishment of a policy making mechanism with a supporting **national coordinating body**, or strengthening a relevant agency, should one exist, for such purposes (COBSEA, 2019).

#### 3.3.1.4 Barrier controls

Barrier controls are specific to the barriers presented for the life cycle phase 1: Source Materials. These aim to reduce the effect of the barriers identified on the aim of preventing leakage of waste into the environment. Examples of relevant barrier controls can be found in RAPs:

| | |
|---|---|
| Research | • Facilitation by regional bodies on the identification of research topics, as well as providing funding for such research, can assist in providing needed information to stakeholders should industry lobby the need for strengthened policy and legal frameworks.<br>• Some RAPs have included research topics for consideration at the regional level, including partner institutions to conduct such research (UNEP/MAP, 2013). |

| | |
|---|---|
| Guidelines and BEP | • Guidelines assist in harmonising the priority actions for a region and may increase the likelihood of the willingness to develop action plans at the national level. Guidelines also enhance the content and quality of national action plans. Consistency can facilitate aggregated reporting, tracking of trends and assessment of progress at the regional level. |
| Model policy, legislation and MBIs | • The regional bodies can facilitate the adoption of national policy and legal frameworks by consolidating research activities and outcomes from the sharing of best practices to develop model legislation (SPREP, 2018a).<br>• Develop and implement model national management plan for marine litter (UNEP, 2018f) |
| Sharing of BEP | • Facilitation by regional bodies of sharing of best practices can help overcome uncertainties of the effectiveness and negative outcomes of policy and legislative frameworks for the prevention and management of marine litter and microplastic.<br>• Regional working groups on marine litter and microplastics. These working groups should include national focal points and experts and should promote implementation of the RAPs, as well as advise and assist the regional bodies responsible for the RAPs (COBSEA, 2019). |

### 3.3.2 Life Cycle Phase 2: Product Manufacture

The product manufacture phase of the life cycle of plastics provides an opportunity to enhance the circular economy of plastics by engaging industry. This phase therefore focuses on enhancing the due diligence of industry, listed as a gap in the 2017 UNEP report titled "Combating marine plastic litter and microplastics: An assessment of the effectiveness of relevant international, regional and subregional governance strategies and approaches" (UNEP, 2017).

#### 3.3.2.1 Pressure – Industry BEP

The product manufacture phase provides a mechanism to improve **industry best environmental practice** (BEP). In particular, this life cycle phase provides an opportunity to improve the design of products as well as prevention of pollution by leakage during the manufacture of plastic products.

#### 3.3.2.2 *Prevention control – Design for reuse, repair and recyclability*

Attaining higher collection and recycling rates is often directly related to the design of plastics and products that contain plastics (OECD, 2019a). RAPs promote activities that encourage the recyclability of plastic products, such as reducing the use of additives (OSPAR Commission, 2014). Product design modifications have also been suggested to substitute expanded polystyrene and extruded polystyrene in articles and to minimise EPS consumption (Lassen et al., 2019).

Extended Producer Responsibility (EPR) Strategies are commonly promoted in RAPs, requiring producers, manufacturers, brand owners and first importers to be responsible for the entire life cycle of their products. In particular to this phase, the design of products is targeted to improve reuse, recycling and materials reduction (HELCOM, 2015). This can include the design of fishing gear to promote its return to land for recycling (OSPAR, 2020). EPR strategies are one of a number of MBIs that can stimulate design for reuse, repair and recyclability. Additional instruments include differential taxes and advanced recycling fees.

#### 3.3.2.3 Barriers

**Industry engagement** and uptake of the principles of EPR can be slow due to concerns of lower profit margins resulting from increased production costs or constrained markets due to reuse and repair. This may be particularly relevant to smaller business. Those wishing to participate in EPR schemes may

be competitively disadvantaged by these extra costs compared to those manufacturers not participating (referred to as free-riders) for whom production costs will be lower.

**Community awareness** to improve understanding of the need for product eco-design can provide pressure on industry to facilitate a circular economy by facilitating recycling processes. Industry awareness of reuse and repair systems will provide critical support and engagement by consumers.

#### 3.3.2.4 Prevention control – PCR Content

The inclusion of post-consumer resin (PCR) in the manufacture of plastic products has been increasingly targeted by governments and industry. It has also been recognised within RAPs that sustainable procurement policies contribute to the promotion of consumption of PCR (UNEP/MAP, 2013).

#### 3.3.2.5 Barriers

Voluntary commitments by industry to include PCR in their products has increased over recent years. However, the insufficient **availability** of quality PCR has presented challenges in meeting the targeted percentage of PCR content relative to the increase in production due **to higher product demand.** Policy and legislative strategies must support the demand for PCR, but also the supply of quality PCR. The cost of including PCR content is also greater than using virgin plastics. Research into the effectiveness of incorporating plastic waste into infrastructure, such as roads, pipes, concrete, etc. is increasing, as is the uptake of these technologies.

#### 3.3.2.6 Prevention control – Pollution elimination

Plastic pollution resulting from the manufacture of plastic products and components can result in the discharge of plastics in the form of pellets, flakes and powders. These can be spilled during production and transport. Due to their small size, they can easily make their way into the environment. Pellet loss from industrial sources is specifically recognised in a number of RAPs and prevention measures are promoted (OSPAR Commission, 2014).

The Operation Clean Sweep (ACC, 2020) program is a set of best practices aimed at zero pellet loss. Polystyrene producers and converters have also been highlighted for promotion of compliance with Operation Clean Sweep (HELCOM, WS RAP ML 4-2019). Requirements regarding pellets and dust emission can also be made a component of environmental permits for producers and converters (HELCOM, WS RAP ML 4-2019, document 3-1).

#### 3.3.2.7 Barriers

The Operation Clean Sweep program is industry-managed and compliance is voluntary. The program has been criticised for not including external auditing schemes and mandatory reporting of spills, as well as not covering the whole supply chain. There are limited examples of pollution regulation that recognise industrial pellets as a risk to environmental quality standards or environmental permits for producers and converters. In lieu of national policies, NGOs are actively promoting industry engagement in Operation Clean Sweep.[4]

#### 3.3.2.8 Barrier controls

Barrier controls are specific to the barriers presented for the life cycle phase 2: Product Manufacture. These aim to reduce the effect of the barriers identified on the aim of preventing leakage of waste into the environment. Examples of relevant barrier controls can be found in RAPs:

[4] https://www.tangaroablue.org/pelletalertproject/zero-pellet-loss-through-operation-clean-sweep/

| | |
|---|---|
| Research | • Exploring options with industry has been suggested for the development of design improvements that could reduce the impacts on the marine environment (OSPAR Commission, 2014). Other research into the **release of microplastics** during intended use will assist in engaging industry in designing materials that minimise leakage from abrasion. In addition, the evaluation of the direct costs and loss of income to industry (UNEP/MAP, 2013) will assist in engaging manufacturers to improve design.<br>• The **mapping** of industry and private sector players in the region by regional bodies is a key activity in understanding the value chain landscape in the region. Identification of main sources of industrial pellets has been suggested (UNEP/MAP, 2013). This will contribute to a mapping of the key industry and private sector players in the region.<br>• Research into the design and **effectiveness of policies, legislation and MBIs** (UNEP/MAP, 2013) will assist governments in determining which approaches are best suited to their domestic context. Examples can be found in Ocean Conservancy's Plastics Policy Playbook (Ocean Conservancy, 2019).<br>• The use of technical tools and approaches to stimulate the design of sustainable plastics is discussed in an OECD background document (OECD, 2018b). This can stimulate research topics at the regional level. In addition, methods for **auditing PCR content** will be important as these targets become mandatory.<br>• The use of alternate materials may present greater overall environmental impacts across their life cycle than plastics. A life cycle assessment of alternate materials will allow for consideration of these unintended outcomes (OECD, 2018b). |
| Guidelines and BEP | • The establishment of procedures and manufacturing methodologies in collaboration with the plastics industry has been suggested for the minimisation of microplastics (UNEP/MAP, 2013).<br>• Develop a framework for regulation of environmentally friendly products (UNEP, 2018f).<br>• To reduce plastic pollution from the manufacturing phase, the OSPAR Background document on pre-production Plastic Pellets (OSPAR, 2018) provides options to strengthen the voluntary industry-developed program to prevent pellet leakage from factories, known as Operation Clean Sweep (recently enhanced to "OCS Blue"). OSPAR aims for greater prevention strategies across the entire supply chain, covering leakage of pellets, flakes, powders and liquid forms of plastics. |
| Model policy, legislation and MBIs | • A number of different MBIs have been implemented across the globe that stimulate design for recyclability, as well as the development of reuse and repair systems. These can be voluntary or regulatory in nature. Differential taxes have been employed that are based on the recyclability of products. Further examples can be found in Policy Approaches to Incentivise Sustainable Plastic Design, OECD Environment Working Papers (OECD, 2019b).<br>• The demand for PCR can be stimulated through policy approaches. Examples to assist in designing policy and regulatory frameworks for procurement, as well as market-based instruments, can be found in Improving Markets for Recycled Plastics: Trends, Prospects and Policy Responses (OECD, 2018a).<br>• Encourage, based on existing labels such as the EU Ecolabel and the Nordic Ecolabel, exchange with international environmental certification schemes for information and inclusion of the management and prevention of marine litter in their lists of criteria (HELCOM, 2015). |
| Sharing of BEP | • Exchange of best practices aiming at zero pellet loss along the whole plastics manufacturing chain from production to transport is also promoted (OSPAR Commission, 2014).<br>• Establish a dialogue and negotiate on solutions with business and industry to (i) develop design improvements that reduce the negative impacts of products entering the marine environment, and (ii) reduce over-packaging and promote wise packaging (HELCOM, 2015). |

### 3.3.3 Life Cycle Phase 3: Use

The primary pressures in the use life cycle phase are **industry best practices** and **consumer practices** that lead to undesirable outcomes. These may be practices that are absent, practices that are inadequate or those that are in direct contradiction with desirable practices.

#### 3.3.3.1 Pressure – Industry best practices

A number of industries have been recognised in RAPs as major contributors to marine litter and microplastics. Poor application of best environmental practices can lead to leakage from fishing vessel operations, shipping operations, cruise ships and beachside tourist enterprises, amongst others (SPREP, 2018a). Promotion of best practices that support the 3R hierarchy are key to supporting a circular economy.

#### 3.3.3.2 Prevention control – Industry reuse and repair

The waste hierarchy promoted in RAPs favours reuse and repair over recycling. Design for reuse and repair is therefore encouraged. EPR and deposit/return schemes will enable a system of reuse or repair by industry and these are also promoted in RAPs. Expandable polystyrene boxes in the fishing sector and beverage packaging have been highlighted for deposit, return and restoration systems (UNEP/MAP, 2013). Voluntary agreements with retailers and supermarkets are also encouraged for the sale of products as refills in reusable containers (UNEP/MAP, 2013).

#### 3.3.3.3 Barriers

Low **industry engagement** due the required logistics, infrastructure and systems not in place (authorised repairers, etc) which would take additional resources (time, funds) to establish or establish within existing systems, where appropriate. Methods of auditing reuse and repair claims would need to be developed.

**Consumer awareness** and support for reuse and repair systems would encourage industry to adopt such measures without fear of losing market competitiveness due to additional costs or less attractive products showing signs of wear and tear.

#### 3.3.3.4 Pressure – Consumer consumption

**Consumption by consumers** is a major driver of production of household products as well as the generation of waste. It is therefore key that the level of consumption is targeted as a method to reduce the likelihood of leakage into the environment.

#### 3.3.3.5 Prevention control – Elimination and reduction

Many RAPs promote the use of fiscal and economic instruments to reduce the consumption of plastic products (UNEP/MAP, 2013), particularly where these are commonly found in the coastal and maritime zones. Policies and regulations that are commonly promoted in RAPs are:

- Plastic bag (thin) – reduction through bans or taxes
- Microbeads – reduction through bans or voluntary agreements with industry leading to elimination
- Single-use plastics (SUPs) – bans on plastic bags, straws, earbud sticks, take-away food and beverage containers, packaging.

#### 3.3.3.6 Barriers

Awareness of alternatives, particularly should products be banned, will also enhance consumer support and engagement for a change in practice. It is therefore important to provide such information as part of campaigns leading up to policies going into effect.

Awareness campaigns, such as Beat the Microbead[5] have greatly assisted in gaining public support for bans on microbeads in personal cosmetics. The Adopt-a-Beach and Fishing-for-Litter programs also create awareness through action.

#### 3.3.3.7 Barrier controls

Barrier controls are specific to the barriers presented for the life cycle phase 3: Use. These aim to reduce the effect of the barriers identified on the aim of preventing leakage of waste into the environment. Examples of relevant barrier controls can be found in RAPs:

| | |
|---|---|
| Research | • Assess relevant instruments and incentives to reduce the use of single-use and other items, which impact the marine environment, including the illustration of the associated costs and environmental impacts (OSPAR Commission, 2014).<br>• Reduce the consumption of single use plastic bags and their presence in the marine environment, supported by the development of quantifiable (sub) regional targets, where appropriate (OSPAR Commission, 2014). |
| Guidelines and BEP | • Develop a regional model communication, awareness and education action plan and implement in countries (SPREP, 2018a). |
| Model policy, legislation and MBIs | • Eco-labelling of plastic products to indicate their environmental impact should be encouraged (UNEP, 2018f).<br>• Develop model legislation to ban single use plastics, Styrofoam and plastic packaging (SPREP, 2018a). |
| Sharing of BEP | • Promote initiatives and exchange of best practice aiming at zero pellet loss along the whole plastics manufacturing chain from production to transport (OSPAR Commission, 2014).<br>• Demonstrate and make available recyclable and biodegradable options (SPREP, 2018a). |

### 3.3.4 Life Cycle Phase 4: End-Of-Life

The primary pressures in the end-of-life life cycle phase that can be facilitated through RAPs are **best environmental practices** for waste management by governments and poor **consumer practices**.

#### 3.3.4.1 Pressure – Government best environmental practice

Effective solid waste management is a primary mechanism for preventing leakage of litter and microplastics into the environment. It is recognised that investment in collection and sorting infrastructure can be stimulated by stronger policy frameworks at the national level (OECD, 2019a). The policy approaches discussed in the first three life cycle phases would directly or indirectly contribute to the effectiveness and financial viability of waste management services. This includes a reduction in the overall generation of waste, but also fewer wastes generated that are not recyclable, as well as improvement in the quality of recyclable wastes.

#### 3.3.4.2 Prevention controls – Environmentally sound waste management

Marine litter management should be an integral part of solid waste management and other relevant strategies to ensure environmentally sound management of human activities and rational use of resources (UNEP, 2018f). Addressing illegal dumping is a component of environmentally sound waste management, including closing existing illegal dumps, and strengthening enforcement measures to combat illegal dumping and illegal solid waste or sewage disposal in the coastal zone and rivers, in accordance with national legislation (COBSEA, 2019).

[5] https://www.beatthemicrobead.org/

#### 3.3.4.3 Barriers

**Funding** has commonly been highlighted as a barrier to effective and sustainable waste management and has also been recognised in RAPs. Governments can be assisted with information on best practices and varied approaches to funding waste management systems.

#### 3.3.4.4 Pressure – Consumer practices

Waste management services can be greatly enhanced by the actions of consumers once a product reaches end of life. The second pressure identified at the end-of-life phase of plastic products is therefore those consumer practices that support the effectiveness and viability of waste management services, sometimes referred to as gateway services.

#### 3.3.4.5 Prevention control – Sorting

The at-source sorting of waste reduces contamination, making single-stream collection services possible, where appropriate, but also simplifying second-phase sorting processes and cleaning operations. This can reduce the amount of recyclable material being sent to landfill or incineration with or without energy recovery.

#### 3.3.4.6 Barriers

Awareness of the need to sort, or low confidence in the outcomes of sorting efforts, can reduce participation in such activities. Consumer awareness of the types of waste accepted by recycling streams and any pre-disposal separation or sorting requirements will reduce contamination at sorting facilities as well as the amount of recyclable materials being sent to landfill. Awareness-raising activities are included in RAPs and can assist national programs in this regard.

#### 3.3.4.7 Prevention control – Drop-off

Deposit-return schemes have been adopted for PET and glass bottles and aluminium cans (Ocean Conservancy, 2019). The design of these schemes can vary with regard to the deposit paid by consumers, the fund these fees contribute to and the level of technology used. Deposit schemes are also implemented at different points in the value chain. Manufacturers may apply a deposit to distributors to encourage the return of products for recycling (OECD, 2016).

#### 3.3.4.8 Barriers

Awareness by consumers of the deposits paid (e.g. through labelling) can stimulate the return of packaging. Schemes should be designed to include public education on the location of drop off facilities, their hours of operation, the products accepted and any separation or sorting required. Deposit-return schemes that are managed by a particular industry sector may limit the options for the inclusion of other types of beverage containers. A limited number of drop-off facilities may also limit the options for participation.

#### 3.3.4.9 Barrier controls

Barrier controls are specific to the barriers presented for the life cycle phase 4: End-of-life. These aim to reduce the effect of the barriers identified on the aim of preventing leakage of waste into the environment. Examples of relevant barrier controls can be found in RAPs:

| | |
|---|---|
| Research | • Research options to address sources including from the Study to support the development of measures to combat a range of marine litter sources (Eunomia, 2016).<br>• Identify and disseminate market information for recyclables (SPREP, 2018a). |

| | |
|---|---|
| Guidelines and BEP | • Develop regional sectoral guidelines on the prevention and reduction of marine litter from land-based sources, particularly for sectors of waste management, tourism and plastic manufacturing (COBSEA, 2019).<br>• Prepare and agree on HELCOM guidelines on marine litter references to be included in national and local waste prevention and waste management plans (HELCOM, 2015).<br>• Provide guidelines on best practice routines with regard to cleaning and collection systems to prevent litter from land entering the aquatic environment (HELCOM, 2015). |
| Model policy, legislation and MBIs | • Integrate waste pickers in formal systems of waste management (COBSEA, 2019).<br>• Enter into dialogue with the industry on waste management practices that impact on the marine environment and identify incentives/measures to promote sustainable practices (COBSEA, 2019). |
| Sharing of BEP | • Share best practice on waste management, e.g. on landfill bans (HELCOM, 2015; OSPAR Commission, 2014).<br>• Develop a database of effective strategies and practices for waste management (UNEP, 2018f).<br>• Exchange experience on best practice to prevent litter entering into water systems and highlight these to River or River Basin Commissions (OSPAR Commission, 2014).<br>• Share best practice on waste management, e.g. on landfill bans of high caloric wastes (especially for plastics) (OSPAR Commission, 2014).<br>• Develop and implement 'Clean schools' and 'Clean Campus' programmes to encourage adoption of waste reduction and recycling best practices in schools and educational institutions (SPREP, 2018a).<br>• Conduct national and regional disaster waste management training (SPREP, 2018a).<br>• Cooperate on the establishment and/or further development of deposit refund systems for bottles, containers and cans in accordance with national law as appropriate (HELCOM, 2015).<br>• Reinforce the "potential polluter pays" with the focus on national levy system to support in-country resources (SPREP, 2018a). |

### 3.3.5 Post Event Mitigation And Restoration

Should preventive controls be insufficient to reduce the cumulative effects of the pressures (causes) across the life cycle of plastics, leakage of litter and microplastics into the environment will occur. Mitigative and restorative controls can be put in place to limit the effect of this leakage, i.e. the accumulation of litter and microplastics dumps, waterways, coastal zones, sewers, stormwater outfalls, soil, air and oceans.

#### 3.3.5.1 Mitigative control: Knowledge gaps on sources and pathways

Understanding the sources and pathways is key to developing effective controls. In support of this, RAPs have suggested research to identify and evaluate accumulation areas and sources of litter, including maritime transport, industrial, agricultural and urban activities, fishing activities, rivers and diffuse inputs, as well as the development of GIS and mapping systems to locate these and common methodologies for evaluating the costs of removal and disposal (UNEP/MAP, 2013). Riverine and sewage inputs are also important pathways requiring further research (HELCOM, 2019). Surveys can assist in establishing and updating baseline data and identifying hotspots (in collaboration with stakeholders (UNEP/MAP, 2013)) to assist in the development of methodologies and assessment criteria (UNEP, 2018f), including removal and in particular for specially protected areas or where protected species are impacted (UNEP/MAP, 2013). Tools such as circulation models can assist in the mapping process.[6]

[6] https://ec.europa.eu/jrc/en/science-update/new-modelling-tool-identify-distribution-and-accumulation-floating-marine-litter

#### 3.3.5.2 Restorative control: Harmonise monitoring methods

Many RAPs promote the development of National Monitoring Programme on Marine Litter based on methodologies that are harmonised at the regional level and supported by regional guidelines (UNEP/MAP, 2013). The methods suggested in the recently published Guidelines for the Monitoring and Assessment of Plastic Litter and Microplastics in the Ocean (GESAMP, 2019) may also be incorporated (COBSEA, 2019).

The establishment of an Expert Group on Regional Marine Litter Monitoring Programme is also promoted in RAPs. These groups can assist in the preparation of the Regional Marine Litter Monitoring Programme, the design National Monitoring Programme on Marine Litter and the establishment of the Regional Data Bank on Marine Litter (UNEP/MAP, 2013).

The need to harmonise monitoring methods is supported in RAPs:

| | |
|---|---|
| Research | • Mapping of snagging sites or historic dumping grounds and a risk assessment for identifying where accumulation of ghost nets pose a threat to the environment and should be removed (HELCOM, 2015).<br>• Develop sub regional or regional maps of hotspots of floating litter, based on mapping of circulation of floating masses of marine litter, and identification of hotspots of accumulation on coastal areas and the role of prevailing currents and winds (OSPAR Commission, 2014). |
| Guidelines and BEP | • Based on the risk assessment conducted in RS10 and identification of accumulation areas, initiate removal of ghost nets and their safe management on land (HELCOM, 2015).<br>• Investigate and promote with appropriate industries the use of Best Available Techniques (BAT) and Best Environmental Practice (BEP) to develop sustainable and cost-effective solutions to reduce and prevent sewage and storm water related waste entering the marine environment, including micro particles(OSPAR Commission, 2014).<br>• Develop guidelines for the preparation of the National Marine Litter Monitoring Programmes, in collaboration with the relevant international and regional organizations, based on ecosystem approach (UNEP/MAP, 2013)<br>• Develop best practice on environmental friendly technologies and methods for cleaning (OSPAR Commission, 2014). |
| Sharing of BEP | • Exchange experience on best practice to prevent litter entering into water systems and highlight these to River or River Basin Commissions (OSPAR Commission, 2014).<br>• Conduct regional training on the development and implementation of harmonized National Marine Litter and Microplastic Monitoring Programmes, also addressing associated data management needs and reporting (COBSEA, 2019).<br>• Establish an exchange platform on experiences on good cleaning practices in beaches, riverbanks, pelagic and surface sea areas, ports and inland waterways (OSPAR Commission, 2014). |

#### 3.3.5.3 Restorative control: Sustainable removal methods

Removal of marine litter and microplastic is more appropriate to the accumulation zones of waterways, coastal zones and oceans. RAPs have been successful in promoting regular national marine litter cleanup campaigns and supporting the International Coastal Cleanup Campaign. In addition, the sustainable practices of the Adopt-a-Beach and Fishing-for-Litter practices [7] are promoted in consultation with the competent international and regional organizations and in partnership with

[7] See also DEFISHGEAR

fishers. Adequate collection, sorting, recycling and/or environmentally sound disposal of the litter should also be ensured (UNEP/MAP, 2013).

The need for sustainable removal methods is supported in RAPs:

| | |
|---|---|
| Research | • Mapping of snagging sites or historic dumping grounds and a risk assessment for identifying where accumulation of ghost nets pose a threat to the environment and should be removed (HELCOM, 2015).<br>• Develop sub regional or regional maps of hotspots of floating litter, based on mapping of circulation of floating masses of marine litter, and identification of hotspots of accumulation on coastal areas and the role of prevailing currents and winds (OSPAR Commission, 2014). |
| Guidelines and BEP | • Risk assessment conducted in RS10 and identification of accumulation areas to inform removal of ghost nets and their safe management on land (HELCOM, 2015).<br>• Develop guidelines for the preparation of the National Marine Litter Monitoring Programmes, in collaboration with the relevant international and regional organizations, based on ecosystem approach (UNEP/MAP, 2013)<br>• Develop best practice on environmental friendly technologies and methods for cleaning (OSPAR Commission, 2014). |
| Sharing of BEP | • Conduct regional training on the development and implementation of harmonized National Marine Litter and Microplastic Monitoring Programmes, also addressing associated data management needs and reporting (COBSEA, 2019).<br>• Establish an exchange platform on experiences on good cleaning practices in beaches, riverbanks, pelagic and surface sea areas, ports and inland waterways (OSPAR Commission, 2014). |

## 3.4 Findings of Analysis of Indicators

The Bowtie analysis shows the interplay between multiple sources of risk and their cumulative consequences. The control measures were categorised into preventive, barrier, mitigative and restorative controls.

The second phase of the analysis considers the management controls. These contribute to an **enabling environment** that improve the likelihood of success of the control factors in preventing leakage. Indicators are grouped into input, process and performance indicators. Monitoring and evaluation is one of the management controls and the outputs for each of the life cycle phases reflected in the Bowtie analysis are therefore presented within the analysis of management controls under the performance indicators.

The RAPs are first assessed for the inclusion of the indicator, followed by a summary of the measures included in RAPs for that indicator, building the management component and enabling environment of a regional marine litter action plan as a management strategy.

### 3.4.1 Introductory overview

The **primary objective** of regional marine litter action plans is the prevention & reduction of marine litter. The instruments are generally voluntary, with some operating within binding framework. **Actions** include those of a preventive and mitigative nature, including monitoring & evaluation. The **geographic range** is predominantly the coastal zone and maritime areas within national jurisdiction, with urban areas target for waste management. **Environmental zones** targeted for protection are marine areas and freshwater environments that lead to the oceans.

### 3.4.2 Input Indicators

#### 3.4.2.1 Scope

As suggested by the name, the regional marine litter action plans have a **regional** scope, often defined within legal instruments.

#### 3.4.2.2 Maturity

Regional action plans for the prevention of marine litter were initiated under the UNEP Regional Seas Programme, with the first action plans being adopted in 2007/8. Since then, additional regions have adopted action plans specific to marine litter and others have revised their action plans. The maturity of the concept is therefore **high**, having been in place for over a decade, making them a well-established instrument with many examples of implementation across countries.

#### 3.4.2.3 Scale

As the adoption of regional marine litter action plans has grown, only one region remains under the Regional Seas Programme with no marine litter action plan or plans underway to develop one. In addition, action plans have been adopted under a number of regional economic fora, providing further international coverage. The scale of these action plans is therefore **high**, covering the majority of countries.

### 3.4.3 Process Indicators

#### 3.4.3.1 Governance

##### 3.4.3.1.1 Management targets

The management target/s reflect the high-level objective of the RAPs in order to achieve the broader goal. The operational targets support the achievement of the higher-level management target/s.

The overarching management targets agreed in RAPs include quantitative and **qualitative** values. Timelines have may not be explicitly set for these targets but may be inferred from the timespan set for the implementation of the RAPs. For example:

- prevent and reduce **to the minimum** pollution by marine litter in marine and coastal environments,
- reduce **to the minimum** impacts on ecosystem services, habitats and species, as well as human health and safety.
- reduce by 2020 to levels where **properties and quantities do not cause harm** to the coastal and marine environment.
- a **significant quantitative reduction** of marine litter by 2025 compared to 2015.

Measuring progress towards qualitative targets such as those listed above may be challenging due to the imprecise nature of determining what levels of pollution would meet the criteria of 'minimum.' However, measuring progress towards overarching **quantitative targets** requires data to determine threshold values for maximum levels of marine litter, as well as sufficient ongoing monitoring according to adequate standards to allow for assessment. Examples include:

- reduce marine litter **by 20%** within a timeline of 2024.

3.4.3.1.2 Operational targets

The operational targets of the regional marine litter action plans are not always explicitly listed as a target, but reflected in many of the activities agreed to at the regional and national levels. There is a mix of timelines and quantitative values set, with some actions assigned neither value.

**UPSTREAM AND MIDSTREAM MEASURES**

**Legal and policy measures**

Legal and policy measures have been taken in many regions and are further encouraged in RAPs to prevent marine litter. These facilitative measures include:

- regional guidelines on marine litter references to be included in national and local waste prevention and management plans.
- guidelines on best practice routines regarding cleaning and collection systems to prevent land-based litter from entering the aquatic environment.
- establishing a **policy-making mechanism and supporting agency**, or strengthening such existing practices is pointed out, to enhance the implementation of solid waste management policies, as well as **Working Group on Marine Litter,** including national focal points and experts.
- develop **sectoral guidelines** on the prevention and reduction of marine litter from both land-based (focus on waste management, tourism and plastic manufacturing) and sea-based (focus on fisheries and marine/coastal tourism) sources.
- **model legislation** on banning single-use plastic, Styrofoam and plastic packaging have been introduced. To be noticed, some codes, agreements and protocols regarding fishing, cruise ship, tourist resort and disaster management have included awareness-raising element and entered a case by case monitoring and enforcement phase.
- **By 2019**, recommend voluntary agreements with the industry on changes in product design and the application of best practices in handling EPS.
- develop and implement National Action Plans on Marine Litter or equivalent instruments or initiatives serving similar purposes is emphasised.
- For existing National Action Plans, States are to update them to combat pollution from land-based sources and activities, which include specific provisions on marine litter.
- For better implementation, the development and implementation of a **model national management plan** for marine litter is also encouraged.
- In addressing illegal dumping, national legislation regulates issues including the closure of illegal dumpsites on land and strengthening enforcement of illegal dumping, littering on beaches and illegal solid waste or sewage disposal in coastal zones and rivers, for instance.
- number of licenses issued so as to control cruise ship waste.

**Market-based instruments**

Market-based instruments (MBIs) have been introduced as a way to prevent, reduce and control marine pollution through financial incentives. These instruments focus on diverse participants in the whole chain of marketing, from producing to the direct markets for consumers.

- explore and implement, to the extent possible, **EPR schemes** (with a focus on design), sustainable procurement policies and fiscal and economic instruments to promote the reduction in plastic bag consumption.
- Promote **EPR strategies** that require producers, manufactures, brand owners and first importers to be responsible for all life phases of the product, while with a focus on items frequently found in the marine environment.
- development of **deposit-return schemes** for beverage packaging.
- stakeholder participation of retailers and supermarkets through fiscal and economic instruments and voluntary agreements is suggested in the reduction of plastic bag consumption.

- development and implementation of **Sustainable Procurement Policies** on the promotion of recycled products.
- expansion of **user-pay waste collection services**.

**DOWNSTREAM MEASURES**

For the management of end-of-life plastics and to shift from a linear economy to a **circular economy**, the waste hierarchy approach of Reuse, Reduce, Recycle and Return. These include:

- overview report on good waste management and loopholes.
- product replacement to reduce the plastic packaging waste that goes to landfill or incineration without energy recovery.
- develop disaster waste management plans by 2022.
- improvement of at least two dumpsites and landfills by 2022.
- establish appropriate waste management systems to prevent run-off and riverine litter inputs.
- implement appropriate and adequate urban sewer and wastewater treatment plants preventing run-off and riverine inputs of litter.
- guidance on improving stormwater management on a local level to prevent and reduce related waste (including microplastics) from entering the marine environment.

**MICROPLASTICS**

RAPs have paid special attention to microplastics, including **pellets**, in combating marine pollution.

- To minimise the decomposition characteristic of plastics, **collaboration with plastic industry** must be established to work on procedures and manufacturing methodologies.
- **Evaluate products and manufacturing processes** that include microplastic to reduce their impact on the marine environment.
- Establish a framework for regulations of environmentally friendly products targeting primary microplastics.
- **Exchange of best practices** aiming at zero pellet loss along the whole plastics manufacturing chain is promoted from production to transport sectors.
  Engagement with appropriate sectors, including manufacturing and retailers, to explore the possibility of a voluntary agreement to gradually stop the use of microplastic in cosmetics.

**KNOWLEDGE GAPS**

For the identification of existing knowledge gaps, a series of overviews, assessments and evaluations have been planned. These include:

- Assessment of the importance of sewage-related waste from upstream waste flow was to be produced.
- Overview on the most significant sources, prevalence and impact of EPS ending up in the marine environment.
- Microplastic sources from products and manufacturing processes, and their removal in wastewater treatment plants.
- Map regional landfills and dumpsites that are possible to pose a risk to the marine environment.
- Evaluate potential harm from items including cigarette filters/butts, balloons, shotgun cotton buds and bio-film.
- Assess existing legislation and identify relevant measures, related instruments and incentives with stakeholders to reduce the use of single-use and other items.

#### 3.4.3.2 Management

**Local capacity building and development**

Capacity building can be provided by the Secretariat of the RAP but can also be part of national implementation plans.

**Regional working groups** are to be established by the Secretariat to coordinate stakeholder participation and advise on appropriate action. Mapping of stakeholders in each country and focal points would support the review of government efforts and capacity building for staff from national, provincial, and municipal governments, and port authorities.

Secretariats are also requested to support national efforts in building adequate institutional, policy and implementation frameworks, coordination across sectors, as well as regional and international cooperation.

Secretariats have been requested within RAPs to provide and organise capacity building in the form of **technical assistance** on the prevention and reduction of marine litter from land-based and sea-based sources to staff from national and municipal governments, port authorities and the shipping industry. Regional workshops and training courses are suggested as methods to achieve this.

National actions for providing local capacity building and development include support for faith-based groups, schools and other community groups to take the lead in initiatives such as coastal clean-ups. Support for initiation of producer responsibility schemes or deposit systems led by communities or businesses is also requested.

**Ongoing funding secured**
Sources of funding are identified and some are suggested. Timetables with associated costs of implementation have been outlined with sources of funding identified. This varies from the Secretariat to external funding sources, such as international investment programs, UNEP, GEF and other international partner countries. Countries are also encouraged to collaborate with government agencies and departments and develop partnerships in order to secure funding.

**Monitoring**
Monitoring is a strong feature of the Regional Seas marine litter action plans. Some have developed progress indicators including baselines and targets with a timeline for achieving these targets.

To support and coordinate data collection and exchange, a Regional **Data Bank** on Marine Litter is planned, including data collection for regular assessment of the state of marine litter. In addition, **Expert Groups** on Regional Marine Litter Monitoring Programme are suggested and organised. To facilitate the development of **National Marine Litter Monitoring Programme**, RSP Secretariat is requested to prepare the **Guidelines** for the preparation of the National Marine Litter Monitoring Programme. Under provided guidelines, the amount of beach litter, for instance, is recorded according to the types listed.

These specific regional guiding documents (methodologies, guidelines and reporting protocols) for assessment and monitoring include sources, types, distribution, amounts and impacts of marine litter and microplastics. To prepare for better monitoring practices, the **standardisation** of methodologies for studying and reporting on marine litter and microplastics, updating baseline data and the identification of hotspots of land-based and sea-based sources of marine litter and microplastics are conducted.

Under an overarching regional ecological objective of preventing marine and coastal litter from adversely affecting coastal and marine environment, **specific indicators** have been selected. For specific monitoring indicators, beach, seafloor, floating marine litter (including microplastics) and

marine litter ingested by marine organisms (including sea turtles and fulmar) are selected for identifying marine litter baseline values. In applying these indicators, for instance, seafloor litter is monitored through counting litter caught in the fish trawl.

In the process of **coastal clean ups**, standardising sampling methods is required. These regional data collections aim to track the frequency and progress of cleaning activities, as well as to help States understand the changes in type and volume of marine litter. With the collected data, States can quantify the possible sources of the collected litter and better control litter at source. Another special case is the monitoring of **disaster waste**. Its focus is the formulation, audit and improvement of the Standard Operating Procedures, ensuring that all emergency services and key personnel are in place and trained.

For member States, to perform their obligations under regional conventions and protocols, they are requested to **design National Monitoring Programmes on Marine Litter**. For monitoring programmes, partnerships with research and academic institutions is recommended. To support monitoring efforts from existing waste management, **domestic legislation** should also be reviewed, updated or revised for litter prevention and monitoring efforts. The monitoring and assessment of marine litter and its impacts can improve the application of a science-based approach in combating marine litter.

**Reporting**

A primary role of RAPs is the monitoring and evaluation of activities that contribute to the achievement of the overall objectives of facilitation. Regional reporting should therefore include aggregated national reports on the activities undertaken at the national level and the results achieved, as well as activities undertaken at the regional level by the regional body. Regional reports can also highlight delivery against Sustainable Development Goal target 14.1 and other relevant Goals and targets, based on National Marine Litter and Microplastic Monitoring Programmes.

*National reporting*

Formats and timelines for national reporting (commonly requested biennially) should include legal and policy elements as well as results of national monitoring programmes. For legal and policy elements, this could include:

- Policy and legal instruments, including a national action plan, to prevent and reduce the generation of marine litter and microplastics
- Institutional arrangements in this regard
- Assessment of the effectiveness of the implementation of the measures
- Difficulties in the implementation of measures encountered (UNEP/MAP, 2013).

Elements on the implementation of the National Marine Litter Monitoring Programme should contain, at a minimum, (UNEP/MAP, 2013):

- Structure and content of the monitoring programme;
- Survey and monitoring locations, stations, parameters, indicators, frequency, etc.;
- Responsible institution and participating institutions;
- Beach litter assessment results;
- Benthic litter assessment results;
- Floating litter assessment results;
- Effectiveness in the implementation of the National Marine Litter Monitoring Programme; and
- Difficulties in the implementation of the National Monitoring Programme.

**Evaluation and review**

The frequency of evaluation and review of RAPs can be specifically scheduled or the review period may depend on respective implementation period of the RAP. The evaluation and subsequent revision of RAPs is to be based on monitoring outcomes (Quality Status Report, for instance) and measured against **key performance indicators** for implementation activities. Visions for updated RAPs after evaluation and review include reducing waste from specific sources, including cruise ships and tourism and enhancement of infrastructure to catch litter.

#### 3.4.3.3 Co-operation

**Domestic stakeholders included**

The principle of **public participation** and **stakeholder involvement** have been included as overarching principles for the implementation of RAPs.

In regard to prevention measures that involve domestic stakeholders, manufacturing procedures and methods with plastic industry for the minimisation of decomposition characteristics of plastic and reduction of microplastic have been established. Other stakeholders, including regional, national and local authorities, industries such as maritime and tourism sector, fisheries, aquaculture, as well as civil society are involved in the cooperation on combating marine litter.

Programmes and initiatives for the removal and sound disposal of land- and sea-based marine litter should be developed and implemented together with relevant stakeholders. Specifically for consumption and production phases, to achieve a sustainable target, **a multi-stakeholder whole lifecycle approach** can prevent and reduce leakage at source. For training across sectors and among different stakeholder groups, regional education and training has been conducted to enhance understanding of marine litter generation pathways, impacts and possible prevention action, so as to facilitate the application of technical sectoral guidelines.

**International capacity building**

Cooperation with competent **international and regional organisations, as well as relevant scientific institutions** on marine litter is regarded as an essential element in RAPS. In practice, a **Regional Cooperation Platform** on Marine Litter has been established and initiatives on coordinating, consulting, exchange of good practices is put forward.

Specifically, in association with monitoring programmes on microplastics, regional training on the development and implementation of harmonising National Marine Litter and Microplastic Monitoring Programmes as well as relevant data management and reporting, is to be conducted. Under multilateral environmental agreements related to marine litter, institutional cooperation with relevant international and regional entities to the implementation of RAPS is proposed. In human capacity development aspects, **national and regional training** for waste management, including the 'train the trainer' model has been incorporated and conducted.

Establishing institutional cooperation with relevant global and regional entities can support the implementation of RAPs, relevant Sustainable Development Goals (SDGs) and other relevant multilateral environmental agreements (MEAs). These include MARPOL Annex V, the London Convention and Protocol thereto, the Basel Convention, the Convention on Biological Diversity, the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA), the IMO and the FAO.

#### 3.4.3.4 Co-benefits

Having recognised the possible environmental, economic, health, aesthetic and cultural threats from marine litter, especially socioeconomic losses in marine sectors resulting from degradation of marine and coastal habitats and ecosystems, the assessments of impact of marine litter on **human health** as well as the **socio-economic aspects** should be conducted based on common agreed methods, national monitoring and surveys.

Combating marine litter could be closely linked to economic benefits, for instance, the Fish-for-Litter project can reduce the time fishers spend untangling nets, and gain support from stakeholders including port authorities and fishing industry. In terms of social aspects, fishers' action can raise awareness among the fishing industry and the general public, as well as leading to changes in practices and culture in the fishing sector.

### 3.4.4 Performance Indicators

In lieu of the development of quantitative indicators for assessing marine litter, the effectiveness of regional marine litter action plans can be measured in output and outcomes indicators.

Performance indicators can be divided into output indicators, outcome indicators and environmental indicators. Environmental monitoring is predominantly a national activity, but regional bodies can contribute to research in this area where a regional approach is beneficial. An example is the OSPAR research titled Composition and Spatial Distribution of Litter on the Seafloor.[8]

#### 3.4.4.1 Outputs

##### 3.4.4.1.1 Outputs for life cycle phase 1: Source materials

The effectiveness of RAPs in the life cycle phase of **source materials** can be measured by the outputs relevant to this phase that assist in achieving the overall role of RAPs for facilitation of action at the national level. Table 4 highlights examples relevant to this role.

*Table 4: RAP outputs for the life cycle phase of source materials*

| Output indicator | Example of outputs |
|---|---|
| Guidelines, BEP | • UNEP Guidelines for the Development of Action Plans on Marine Litter (UNEP, 2019)<br>• Regional Plan on Marine Litter Management in the Mediterranean Article 7 - Integration of marine litter measures into the LBS National Action Plans (LBS NAPs) (UNEP/MAP, 2013) |
| Model legislation, policy, MBIs | • Regulating Plastics in Pacific Island Countries. A guide for policymakers and legislative drafters (SPREP, 2018b) |
| Sharing of best practice for policy and legislation | • The Global Partnership on Marine Litter (GPML) has established regional nodes in the Mediterranean, Northwest Pacific, Pacific, South Asia and the Wider Caribbean.[9] These platforms bring together multiple stakeholders, including government, industry, civil society, academia and other intergovernmental fora. |
| Reporting elements defined | • Regional Plan on Marine Litter Management in the Mediterranean, Annex IV – Elements of National Biennial Reports, Report on the Implementation of the Measures (UNEP/MAP, 2013). |

[8] https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/pressures-human-activities/marine-litter/composition-and-spatial-distribution-litter-seafloor/

[9] https://www.gpmarinelitter.org/regional-nodes

Reporting at the regional level aggregates national reports and it is therefore important to provide guidance on the reporting required by countries. This should include:

- Policy and legal instruments, including a national action plan, to prevent and reduce the generation of marine litter and microplastics
- Institutional arrangements in this regard
- Assessment of the effectiveness of the implementation of the measures
- Difficulties in the implementation of measures encountered (UNEP/MAP, 2013).

An example of outcomes reported for the above regional outputs can be found in the Pacific region where Eight Pacific island countries have banned single-use plastics (plastic shopping bags, straws, cutlery and polystyrene), and seven have announced their intention to do so (SPREP, 2019).

| Output indicator | Example of outputs |
|---|---|
| Guidelines, BEP | • UNEP Guidelines for the Development of Action Plans on Marine Litter (UNEP, 2019)<br>• Regional Plan on Marine Litter Management in the Mediterranean Article 7 - Integration of marine litter measures into the LBS National Action Plans (LBS NAPs) (UNEP/MAP, 2013) |
| Model legislation, policy, MBIs | • Regulating Plastics in Pacific Island Countries. A guide for policymakers and legislative drafters (SPREP, 2018b) |
| Sharing of best practice for policy and legislation | • The Global Partnership on Marine Litter (GPML) has established regional nodes in the Mediterranean, Northwest Pacific, Pacific, South Asia and the Wider Caribbean.[10] These platforms bring together multiple stakeholders, including government, industry, civil society, academia and other intergovernmental fora. |
| Reporting elements defined | • Regional Plan on Marine Litter Management in the Mediterranean, Annex IV – Elements of National Biennial Reports, Report on the Implementation of the Measures (UNEP/MAP, 2013). |

#### 3.4.4.1.2 Outputs for life cycle phase 2: Product manufacture

The effectiveness of RAPs in the life cycle phase of **product manufacture** can be measured by the outputs relevant to this phase that assist in achieving the overall role of RAPs for facilitation of action at the national level. Table 5 highlights examples relevant to this role.

*Table 5: RAP outputs for the life cycle phase of product manufacture*

| Output indicator | Example of outputs |
|---|---|
| Research | • Annex II Potential research topics<br>- Effectiveness of market based instruments related to marine litter.<br>- Evaluation of direct costs and loss of income to tourism and fishery (incomes and stock losses, including protected/endangered species).<br>- Evaluation of costs due to clogging of rivers, coastal power plant cooling systems and/or wastewater purification systems. (UNEP/MAP, 2013). |
| Guidelines, BEP | • OSPAR scoping study on best practices for the design and recycling of fishing gear as a means to reduce quantities of fishing gear found as marine litter in the North-East Atlantic (OSPAR, 2020).OSPAR scoping study on best practices for the design and recycling of fishing gear as a means to reduce quantities of fishing gear found as marine litter in the North-East Atlantic (OSPAR Commission, 2018) |

[10] https://www.gpmarinelitter.org/regional-nodes

| | |
|---|---|
| | • OSPAR Background document on pre-production Plastic Pellets (OSPAR, 2018)<br>• PlasticsEurope adopts new Operating Rules in June 2019, making OCS compulsory for all members from January 2020 (PlasticsEurope, 2019) |
| Model policy, legislation, MBIs | • None found |
| Sharing of BEP | • OSPAR database on good practice examples of marine litter measures and initiatives |

#### 3.4.4.1.3 Outputs for life cycle phase 3: Use

The effectiveness of RAPs in the life cycle phase of **Use** can be measured by the outputs relevant to this phase that assist in achieving the overall role of RAPs for facilitation of action at the national level. Table 6 highlights examples relevant to this role.

*Table 6: RAP outputs for the life cycle phase of use*

| Output indicator | Example of outputs |
|---|---|
| Research | • Scoping study to identify key waste items from the fishing industry and aquaculture (OSPAR Commission, 2019b) |
| Guidelines, BEP | • None found |
| Guidelines, Model policy, legislation | • Regulating Plastics in Pacific Island Countries. A guide for policymakers and legislative drafters (SPREP, 2018b). |

#### 3.4.4.1.4 Outputs for life cycle phase 4: End-of-life

The effectiveness of RAPs in the life cycle phase of **end-of-life** can be measured by the outputs relevant to this phase that assist in achieving the overall role of RAPs for facilitation of action at the national level. Table 7 highlights examples relevant to this role.

*Table 7: RAP outputs for life cycle phase end-of-life*

| Output indicator | Example of outputs |
|---|---|
| Research | • HELCOM RAP ML, RL8 Assess the importance of the contribution of upstream waste flows to the marine environment and, if needed, identify suitable actions (HELCOM, 2019) |
| Guidelines, BEP | • Best practice examples of fishing gear return systems for repairs (OSPAR, 2020) |
| Sharing of BEP | • MARLISCO best practices map, online at: http://www.marlisco.eu/best-practices-map.en.html<br>• Riverine litter as source of marine litter – work session and cooperation between EIHA and HASEC INPUT (OSPAR Commission, EIHA 18/06/16), supported by a workshop on Riverine Litter[11]. |

#### 3.4.4.1.5 Outputs for mitigative and restorative controls

The effectiveness of RAPs in the post-leakage phase can be measured by the outputs relevant to this phase that assist in achieving the overall role of RAPs for facilitation of action at the national level. Table 8 highlights examples relevant to this role.

*Table 8: RAP outputs for mitigative and restorative activities*

[11] https://www.ospar.org/site/assets/files/41639/information_related_to_projects_workshop_riverine_litter-_paris-_4-5_of_june.pdf

| Output indicator | Example of outputs |
|---|---|
| Research | • Survey of Polystyrene Foam (EPS and XPS) in the Baltic Sea (Lassen et al., 2019) – includes sources, transport through wastewater and stormwater discharge and river transport.<br>• Composition and Spatial Distribution of Litter on the Seafloor - OSPAR[12] |
| Guidelines, BEP, policy, legislation, MBIs | • Review of BAT and BEP in Urban Wastewater Treatment Systems focusing on the reductions and prevention of stormwater related litter, including micro-plastics, entering the Marine Environment (OSPAR Commission, 2019a).<br>• HELCOM Recommendation 23/5 - Reduction of Discharges from Urban Areas by the Proper Management of Storm Water Systems (see HELCOM, Outcome of WS RAP ML 4-2019)<br>• Decision IG.22/10 - UNEP(DEPI)/MED IG.22/28 Implementing the Marine Litter Regional Plan in the Mediterranean (Fishing for Litter Guidelines, Assessment Report, Baselines Values, and Reduction Targets) |
| Guidelines for monitoring of marine litter | • Guideline for Monitoring Marine Litter on the Beaches in the OSPAR Maritime Area (OSPAR, 2010)<br>• Monitoring and Assessment Guidelines for Marine Litter in Mediterranean MPAs (Galgani et al., 2019)<br>• OSPAR - CEMP Guidelines for monitoring marine litter washed ashore and/or deposited on coastlines (beach litter)[13]<br>• Regional Plan on Marine Litter Management in the Mediterranean and Related Best Practices Adopt-a-Beach (Main Elements) (UNEP/MED, 2018)<br>• Review of BAT and BEP in Urban Wastewater Treatment Systems focusing on the reductions and prevention of stormwater related litter, including micro-plastics, entering the Marine Environment (OSPAR Commission, 2019a) |
| Sharing of BEP | • Collaboration - Collaboration between OSPAR Commission and Cartagena Convention to harmonize marine litter monitoring for plastic free oceans[14]<br>• DeFishGear Project website[15] |

#### 3.4.4.1.6 Outputs for monitoring and evaluation

The effectiveness of RAPs can be measured by the outputs relevant to all four life cycle phases as well as mitigative and restorative controls, as outlined in previous sections. In addition to these outputs, the contribution of RAPs to solving the global issue of marine litter and microplastics can be assessed by the cumulative results and trends of national marine litter monitoring programmes. These are reflected in regular regional reports. Table 9 highlights examples relevant to this.

*Table 9: RAP outputs for monitoring and evaluation*

| Output indicator | Example of outputs |
|---|---|
| Results for regional monitoring programs | • State of the Baltic Sea – Second HELCOM holistic assessment 2011-2016 (HELCOM, 2018).<br>• OSPAR 2017 intermediate assessment of Beach Litter - Abundance, Composition and Trends.[16]<br>• Marine Litter Assessment in the Mediterranean (UNEP/MAP, 2015). |
| Guidelines for monitoring | • OSPAR - CEMP Guidelines for Monitoring and Assessment of plastic particles in stomachs of fulmars in the North Sea area[17] |

[12] https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/pressures-human-activities/marine-litter/composition-and-spatial-distribution-litter-seafloor/

[13] https://www.ospar.org/work-areas/cross-cutting-issues/cemp

[14] https://www.unenvironment.org/cep/editorial/collaboration-between-ospar-commission-and-cartagena-convention-harmonize-marine-litter

[15] http://www.defishgear.net/

[16] https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/pressures-human-activities/marine-litter/beach-litter/. See also https://oap.ospar.org/en/

[17] https://www.ospar.org/work-areas/cross-cutting-issues/cemp

| | |
|---|---|
| | • OSPAR - CEMP Guidelines on Litter on the Seafloor[18]<br>• Guidelines for the Monitoring and Assessment of Plastic Litter and Microplastics in the Ocean (GESAMP, 2019) |
| Sharing of best practice | • Training of Trainers on Monitoring and Assessment of Marine Litter and Microplastics, based on Handbook of Survey Methodology Plastics Leakage. Plastics Leakage (developed for CSIRO Global Plastic Pollution Project)[19]<br>• OSPAR Workshop on projects related to riverine inputs (micro- and macroplastics)[20]<br>• Examples of inspirational projects and best practices to prevent litter entering the water systems. Section 4 (OSPAR Commission, 2016) |
| Reporting elements defined | • Annex IV - Elements for National Biennial Reports (UNEP/MAP, 2013) - planning and policy frameworks; national monitoring activities<br>• OSPAR online data portal (http://www.ospar.org/data) |

#### 3.4.4.2 Outcomes

Outcomes require baselines to be set. Not all baselines have been determined and, where these have been set, the outcomes have not all been measured. These include,

- Starting at a regional baseline **waste-recycling rate** of 14% in 2014, increase the rate to 60% by 2020 and 70% by 2025;
- Increase the number of national or state **container deposit programmes** from 4 (2014) to 7 (by 2020) and 10 (by 2025).
- Increase the number of national or state **user-pay systems for waste collection** from 9 (2014) to 14 (by 2020) and 21 (by 2025).
- Starting at a baseline rate for **waste collection coverage rate of population** of 88% (urban) and 35% (nationally), achieve a 100% (urban) and 40% (nationally) rate by 2020 and finally reaching 60% nationally by 2025.
- Reduce the number of temporary, unregulated and open dumpsites from over 250 in 2014 to 237 (by 2020), dropping to 225 by 2025. (Pacific)

*Regional reporting*

Regional reporting should contain the two elements of aggregated national reports and results from activities undertaken at the regional level, facilitated by the regional body.

**Elements of aggregated national reports:**

- Guidelines adopted
- Relevant policy, legislation and MBIs adopted
- Results of national marine litter monitoring programmes, including hotspot identification and baseline assessments
- Results of programmes of removal and environmentally sound disposal of existing marine litter

**Elements of regional reports:**

- Setting of SMART operational targets
- Setting of SMART reduction targets, including indicators
- Establishment of BEP sharing platform
- Results of research
- Guidelines developed
- Relevant policy, legislation and MBIs adopted
- Regional state of environment reports (aggregated results of national marine litter monitoring programmes)

[18] https://www.ospar.org/work-areas/cross-cutting-issues/cemp

[19] https://wedocs.unep.org/bitstream/handle/20.500.11822/30267/TOT_Manual_19.pdf

[20] https://www.ospar.org/site/assets/files/41639/information_related_to_projects_workshop_riverine_litter-_paris-_4-5_of_june.pdf

### 3.4.5 Summary of Indicators

The outcomes of operational controls as reflected in the Bowtie analysis across the four primary life cycle phases of marine litter and microplastics have been reflected in the performance indicators of the management controls. These were discussed in the analysis of indicators.

Table 10 summarises the inclusion of these indicators within regional marine litter action plans and provides an analysis of each. Where the indicators are not well represented, this is also reflected in the table.

*Table 10: Summary of indicators for RAPs*

| Indicator Type | Indicator | Description | Evaluation |
|---|---|---|---|
| INPUT | Scope | International, regional or national | Regional |
| | Maturity | Operational years - high, medium, low | High |
| | Scale | Level of adoption | High |
| PROCESS | Governance | Management targets<br>Operational targets | Low<br>High (many inferred) |
| | Management | Local capacity building<br>Ongoing funding secured<br>Monitoring in place<br>Reporting in place<br>Review process defined | Yes<br>Yes<br>Yes<br>Yes<br>Yes |
| | Co-operation | Domestic stakeholder inclusion<br>International capacity building | Yes<br>Yes |
| | Co-benefits | Environmental<br>Social<br>Economic | Yes<br>Yes – limited<br>Yes – limited |
| PERFORMANCE | Outputs | Relative to the facilitative role of RAPs | Yes – not clearly reported |
| | Outcomes | | Yes – mostly environmental, others listed but not yet reported on. |

## 3.5 Conclusion

Regional marine litter action plans function between the international and national levels on the hierarchy depicted in Figure 1 and Figure 2. As a response option to the global issue of marine litter and microplastics, and towards an objective of long-term elimination of discharge to the oceans, regional marine litter action plans provide a robust tool for targeting all life cycle phases in a cooperative and facilitative manner. A suite of tools have been provided, with opportunity for further research and guidelines to be developed, as identified in this report. Further recognition of the co-benefits beyond environmental would be beneficial, including the monitoring of outcomes in this regard.

# 4 PILOT 2: A POTENTIAL NEW INTERNATIONAL FRAMEWORK

## 4.1 Scope of the pilot

There is no international instrument to harmonise and guide national activities towards a global target of zero discharge of litter and microplastics to the oceans.[21] Developing a new international framework would therefore represent a potential response option to the global issue. To analyse the effectiveness of this response option requires modelling of a typical response and understanding its role in a broader management strategy in which multiple pressures can be collectively assessed against the cumulative impacts.

To conduct a Bowtie analysis, this pilot builds a management strategy for an international framework by considering the options presented in the 2017 report titled *Combating marine plastic litter and microplastics: An assessment of the effectiveness of relevant international, regional and subregional governance strategies and approaches* (UNEP, 2017) and incorporating studies relevant to the design of a new international framework. Where possible, examples are drawn from existing instruments.

The analysis of an international framework using the indicators suggested by member states, the Scientific Advisory Committee and major groups and stakeholders draws from existing international instruments recognised to have relevance to the global issue of marine litter. Examples of text from these binding and voluntary instruments relevant to the indicators are used to build the body of management controls of a potential new international framework to prevent marine plastic litter and microplastics.

## 4.2 A new international framework in context

The role of an international framework is to harmonise action at the national level, facilitated through regional institutions. To support this role, institutional arrangements, platforms for knowledge building and assistance for developing countries may be needed. A global target has already been agreed at the international level of long-term elimination of discharge to the oceans, adopting a life cycle approach to achieve this. These roles have been used to guide the identification of pressures and controls, as well as outputs and outcomes, within the Bowtie analysis of the international framework archetype.

## 4.3 Findings of the Bowtie Analysis

The Bowtie for a potential new international framework has been developed using measures adopted in regional marine litter action plans that can be elevated to the international level, supported by literature review. These measures have been grouped into the life cycle phases they can influence and then further categorised into pressures, prevention controls, barriers, barrier controls, mitigative controls and restorative controls, as reflected in Figure 7.

[21] The Honolulu Strategy provides a broad set of goals and strategies to guide national effort but does not suggest institutional and operational mechanisms to achieve these. The Strategy forms a strong basis for a new international framework.

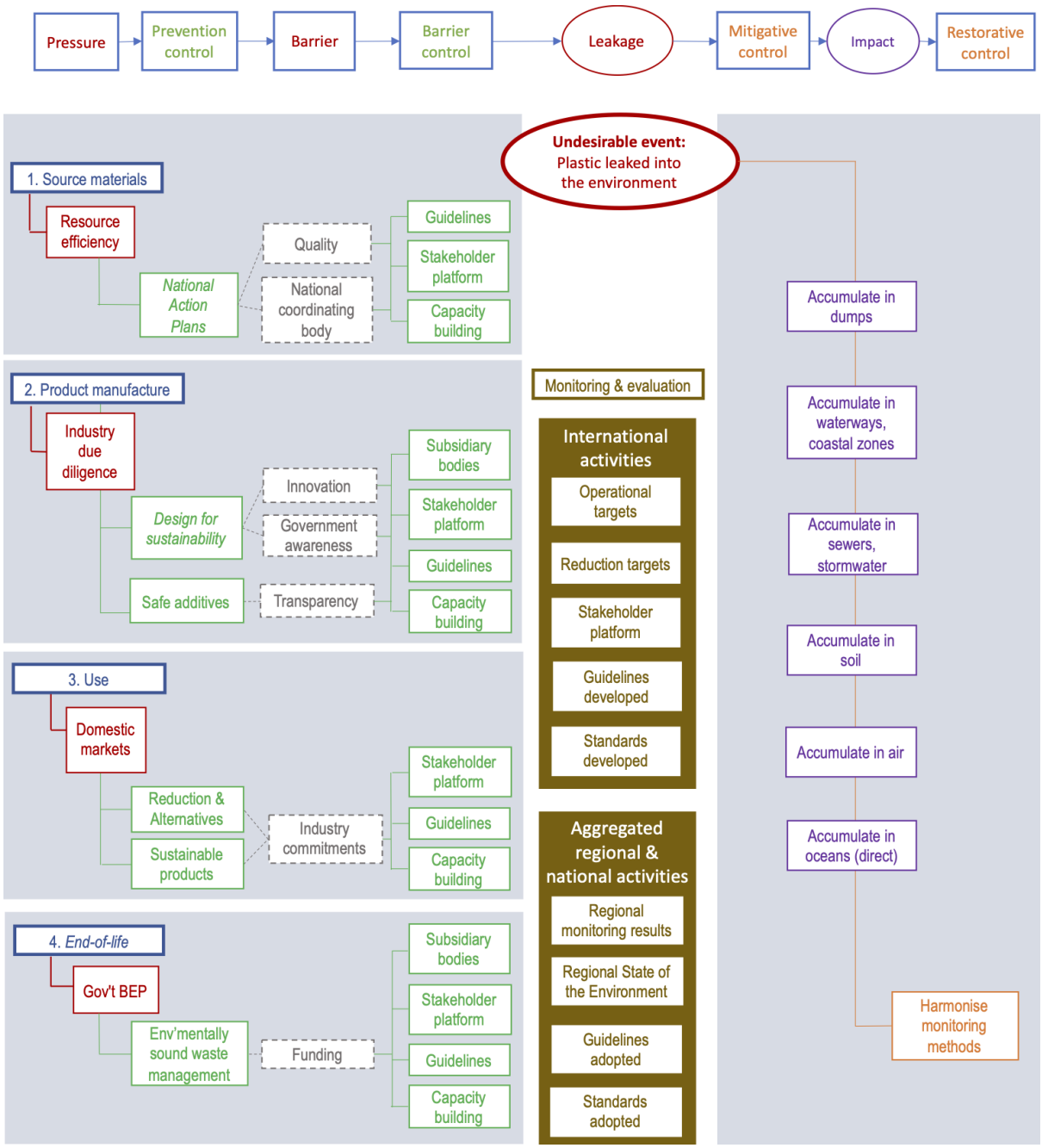


*Figure 7: Bowtie diagram of a management strategy for a new international framework*

## 4.3.1 Life Cycle Phase 1: Source Materials

### 4.3.1.1 Pressure – Low resource efficiency

There are many approaches to addressing resource efficiency which can, directly and indirectly, lead to a reduction in leakage of litter and microplastics to the marine environment (OECD, 2019a). At the global level, a potential international framework can aim to harmonise relevant approaches through the adoption of national action plans that address resource efficiency in the context of marine litter prevention.

#### 4.3.1.2 Prevention control – National action plans

National action plans (NAPs) are policy documents that can be used to facilitate more coherent national actions and more effective implementation towards realising the objectives of an international framework (UNEP, 2018b). These may be in the form of a policy, strategy or roadmap.

The development of national action plans is promoted in existing international instruments, such as the Convention on Biological Diversity (CBD), in which Article 6 requires each Contracting Party to, in accordance with its particular conditions and capabilities:
(a) Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect, inter alia, the measures set out in this Convention relevant to the Contracting Party concerned; and
(b) Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies.

#### 4.3.1.3 Barriers

NAPs are typically voluntary instruments and states are given a higher degree of flexibility in their design in order to allow for domestic situations. This can lead to differences in both the content and the **quality** of the NAPs. In some cases, a mechanism for evaluation of NAPs and endorsement of NAPs by national decision makers has been suggested (UNEP, 2015).

The measures included in an action plan may span a number of public services and therefore require coordination across multiple government authorities. A **central coordinating body** is recommended to facilitate coherent implementation (COBSEA, 2019). As an example, the US Interagency Marine Debris Coordinating Committee (IMDCC) operates under the "Save our Seas Act of 2018" (Public Law No: 115-265). Agency membership of this committee, as well as reporting requirements, is mandated by the Act, thus ensuring a nationally coordinated response.[22]

#### 4.3.1.4 Barrier controls

Barrier controls are specific to the barriers identified for the life cycle phase 1: Source materials. These are described here and examples found in existing global instruments and activities and are noted in the outputs of the performance indicators below.

| Barrier control | Description |
|---|---|
| Stakeholder platform | Government focal points can benefit from engagement with other governments, relevant intergovernmental organisations, scientific advisory bodies, industry, academia and civil society to share priorities, knowledge, best practices and understand socio-economic factors.<br>The Group of Chief Scientific Advisors (EU) has provided a scientific opinion recommending promotion of global cooperation, high-quality scientific exchange and policy coherence regarding microplastic pollution (EU, 2019). |
| Guidelines | Guidelines for the development of regional and national marine litter action plans have been developed by UNEP (UNEP, 2019). These can be complemented by relevant solid waste management guidelines (see Life Cycle Phase: End-of Life). |
| Capacity building | Assistance in the development of national action plans can assist in harmonizing the content of the action plans and work towards a minimum quality standard. Such harmonization would enhance tracking of progress at the global level. |

[22] See https://marinedebris.noaa.gov/IMDCC

### 4.3.2 Life Cycle Phase 2: Product Manufacture

The life cycle phase of product manufacture is an opportunity for industry to make the necessary product enhancements that directly or indirectly contribute to a reduction in leakage of litter and microplastics to the environment.

#### 4.3.2.1 Pressure – Industry due diligence

Low engagement by industry in the principles of product stewardship is reflected in the opportunities and economic viability of end-of-life processes. Improving **due diligence** by industry during the product manufacture phase can therefore enhance the reuse and recyclability of products, providing incentive for the collection and sorting of wastes (UNEP, 2017; UNIDO, 2019).

#### 4.3.2.2 Prevention control – Design for sustainability

Enhanced due diligence by industry can be achieved through, inter alia, product design that stimulates circular economy practices and design that minimises harm from chemical additives. Design for sustainability and safe use of additives can include:

- scrutinizing the necessity of packaging altogether, including of plastics,
- selection of renewable, bio-degradable and compostable materials and additives that are not or less toxic for essential plastic packaging or single-use plastic products;
- designing for less material use to decrease waste;
- designing packaging and products that use a single or small number of polymers that are easy to separate during recycling. (UNIDO, 2019).

#### 4.3.2.3 Barriers

Prevention controls that aim to incentivise enhanced product design must consider the potential to **limit innovation**. Identifying product performance outcomes and sustainability criteria can assist in constraining product design to achieve environmental objectives (European commission, 2020).

**Government awareness** of the legal and policy options available to incentivise behaviour change by industry with regards product design is crucial towards creating a secure environment for investment. This requires an in-depth understanding of the socio-economic benefits and impacts, particularly for smaller and more vulnerable communities.

#### 4.3.2.4 Prevention control – Safe additives

Marine litter and microplastics are known to negatively impact on marine and coastal environmental compartments, but research has shown public health can also suffer from exposure to harmful chemicals at each life cycle phase, including the processes involved in extraction and end-of-life treatment (CIEL, 2019b). The safe use of chemicals is therefore a cross-cutting issue, whereas the additives used in products can be addressed through design at the product manufacture phase.

#### 4.3.2.5 Barriers

Transparency has been called for with regards the use of chemicals in products (UNEP, 2017). This applies to the additives used in the manufacture of plastics and other products that may become marine litter. Providing such transparency may meet with resistance from industry who wish to protect their **intellectual property** (IP).

#### 4.3.2.6 Barrier controls

The design of products can have a direct or indirect outcome on marine litter and microplastics, from both a physical and a chemical aspect. These can be addressed in parallel and do not necessarily require independent controls (CIEL, 2019b). Barrier controls identified here are specific to the barriers identified for the life cycle phase 2: Product manufacture. These are described here and examples

found in existing global instruments and activities and are noted in the outputs of the performance indicators below.

| Barrier control | Description |
|---|---|
| Subsidiary body | The development of global sustainability criteria will require the establishment of subsidiary bodies (e.g. committees, technical working groups) to engage with government, industry and other stakeholders in the design of such criteria relevant to various applications, sectors, resin types, additives, etc. |
| Stakeholder platform | Engagement with relevant stakeholder for addressing the management of chemicals will be required. These include the Stockholm Convention, Strategic Approach to International Chemicals Management (SAICM), Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) , the Center for International Environmental Law (CIEL), the American Chemistry Council (ACC), PlasticsEurope, etc.<br>In addition, sustainable design criteria can build on the work of existing global standards setting bodies, e.g. the International Organization for Standardization (ISO). |
| Guidelines and BEP | Guidance for countries can be provided by the new international framework or by developing more specific guidelines. An example of guidance within an existing framework includes the Stockholm Convention, Part V: General guidance on best available techniques and best environmental practices. Useful measures could include:<br>use of low-waste technology; use of less hazardous substances; promotion of the recovery and recycling of waste and of substances generated and used in a process; replacement of feed materials; good housekeeping and preventive maintenance programmes; minimization of these chemicals as contaminants in products. |
| Capacity building | Assistance in the development of legislative and policy frameworks regarding the use of chemicals in product manufacturing and the regulation of products based on sustainability criteria can be provided under a potential new international framework. |

### 4.3.3 Life Cycle Phase 3: Use

The primary pressures in the use life cycle phase are focuses on the types of products available on the **domestic market**. Suppliers and customers have a role to play in enabling the circular economy through their practices and choices (UNIDO, 2019).

#### 4.3.3.1 Pressure – Domestic markets

Sustainable lifestyles must integrate consumption behaviour that reduces environmental degradation and increases resource efficiency. A new international framework can support governments in their efforts to promote sustainable consumption by, inter alia, **reducing** of undesirable products placed on their markets, stimulating use of appropriate **alternatives** and providing products that perform to **sustainable criteria**.

#### 4.3.3.2 Prevention control – Reduction and alternatives

Reduction in the use of unnecessary and avoidable products will reduce the volume and weight of waste generated. A new international framework can provide the platform and tools for developing voluntary reduction strategies (UNEP, 2018e), where appropriate. Mechanisms can range from pacts and memorandums of understanding to co-regulatory agreements. Assistance can be provided to governments for the design of regulatory reduction strategies as appropriate (UNEP, 2018c). These can range from prohibitions to market-based instruments that make use of levies and taxes or a combination thereof.

Reduction strategies should be supported by the promotion of the provision and use of affordable and fit-for-purpose eco-friendly alternatives (UNEP, 2018e).

#### 4.3.3.3 Barriers

The **commitment of industry** towards reduction strategies (voluntary or binding) and the provision of alternatives will be required to ensure the availability of alternatives. Research into alternatives that do not cause harm requires funding which can be incentivised through market signals or provided from development funds.

#### 4.3.3.4 Prevention control – Sustainable products

Where it is not possible to remove a product from the market or provide a suitable alternative, products should firstly be designed for reuse and then for recycling. The value chain for products and components is global, requiring cooperation between governments, industry, research institutions, academia and civil society. Socio-economic impacts must be considered, including the creation of opportunities for sustainable income and safe working environments in vulnerable communities. Effects on human health (CIEL, 2019b) and climate change must be factored in across the value chain (CIEL, 2019a). Education mechanisms, such as labelling and certification, can promote sustainable consumption patterns by consumers and retailers.

#### 4.3.3.5 Barriers

The commitment of industry in designing products that are sustainable is increasing and should be further promoted by a new international framework. This includes the use of recycled content, the number of materials used and the ease with which products can be dismantled and/or repaired.

#### 4.3.3.6 Barrier controls

The provision of products that foster sustainable consumption practices by consumers and retailers can be promoted through the development of guidelines and best environmental practices, stakeholder platforms and capacity building activities, supported by a new international framework to harmonise priorities this regard.

| Barrier control | Description |
|---|---|
| Stakeholder platform | An example can be found in the European Plastics Pact, which aims to bring together companies and governments to accelerate the transition towards a European circular plastics economy for plastics.[23] |
| Guidelines and BEP | Guidelines can assist in harmonising the priority actions for governments and provide options for consideration at the national level to promote sustainable consumption practices by all sectors across the value chain of plastics. |
| Capacity building | A new international framework should provide support for those countries in need of assistance for the development of policy, including market-based instruments, that foster sustainable consumption by consumers, retailers and other sectors across the value chain. |

### 4.3.4 Life Cycle Phase 4: End-Of-Life

When products reach the end of their useful and intended life, preventive controls undertaken in the earlier life cycle phases should have provided a basis for alternatives to disposal, such as reuse, repair and recycling (UNIDO 2019). A potential new international framework can promote harmonised action towards environmentally sound waste management policies and practices at the national level, complementing existing global instruments.

[23] https://europeanplasticspact.org/

#### 4.3.4.1 Pressure – Government BEP

Integrated and holistic waste management practices based on the waste hierarchy and supported by stable sources of funding are key to preventing leakage and accumulation of wastes and microplastics in the environment (UNEP, 2018e). This includes losses from mismanaged wastes and waste management services (UNEP, 2018d).

#### 4.3.4.2 Prevention control – Environmentally sound waste management

Adequate services must be designed that meet the needs of society in different socio-economic and geographic circumstances.

#### 4.3.4.3 Barrier controls

| Barrier control | RAP measures to facilitate barrier controls |
|---|---|
| Subsidiary body | A scientific advisory committee could provide advice on the environmental impacts of various waste technologies, methods to monitor and track waste management parameters at the global level. |
| Stakeholder platform | Engagement with complementary instruments and stakeholders relevant to the environmentally sound management of wastes should be established. Examples of relevant stakeholders include the Basel Convention, the Stockholm Convention, the London Protocol, the Strategic Approach to International Chemicals, the Center for International Environmental Law (CIEL), the International Solid Waste Association (ISWA), the Association of Plastic Recyclers (APR), the Global Alliance for Incinerator Alternatives (GAIA). |
| Guidelines and BEP | The development of guidelines and BEP can assist governments in designing national strategies for environmentally sound waste management that provide for short-, medium- and long-term priorities. |
| Capacity building | Regional workshops can assist governments in understanding the policy interventions available to drive investment in waste management services, as well as preferred technical mechanisms to achieve environmentally sound waste management. |

### 4.3.5 Post Event Mitigation and Restoration

#### 4.3.5.1 Restorative control: Harmonise monitoring methods

The Honolulu Strategy promotes research on standardization of methodologies to monitor marine debris (including identification and quantification of microplastic) on shorelines, in benthic habitats, and in pelagic waters. The Regional Seas Conventions and Action Plans have been active in harmonising monitoring methodologies within their regions, but also in sharing best practices for such methodologies with other Regional Seas.

## 4.4 Findings of the Analysis of Indicators

### 4.4.1 Introductory overview

The **primary objective** of potential new international framework is the long-term elimination of discharge of marine litter and microplastics to the oceans. This may be a voluntary framework, binding, or a combination thereof. **Actions** include those of a preventive and mitigative nature, including monitoring & evaluation. The **geographic range** is all terrestrial and maritime zones. All **environmental zones** targeted for protection.

## 4.4.2 Input Indicators

### 4.4.2.1 Scope

As suggested by its name, the international framework for marine litter has a global scope.

### 4.4.2.2 Maturity

As the international framework is still at a proposal phase, this indicator is not applicable.

### 4.4.2.3 Scale

An international binding framework would have a minimum participation criteria before entering into force and would therefore be a scale of medium at the lower end of participation, progressing to high as participation increases. This may be gauged on number of countries, global volume of production covered or global volume of high-consumption populations.

A voluntary framework may attract greater participation initially. It is therefore possible such a framework would have a scale of high soon after adoption.

## 4.4.3 Process Indicators

The **primary objective** of regional marine litter action plans is the prevention & reduction of marine litter. The instruments are generally voluntary, with some operating within binding framework. **Actions** include those of a preventive and mitigative nature, including monitoring & evaluation. The **geographic range** is predominantly the coastal zone and maritime areas within national jurisdiction, with urban areas target for waste management. **Environmental zones** targeted for protection are marine areas and freshwater environments that lead to the oceans.

### 4.4.3.1 Governance

Management targets

The effectiveness of an international framework as a response option needs to be measured against a series of management targets. The management targets for this international framework could aim to combat issues of environment and human health resulting from marine litter and microplastics. Examples of management targets from complementary international instruments are provided as a basis for the design of a new international framework.

| Objective | Examples from international instruments |
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| To create a global framework for the oceans to facilitate the prevention and reduction of marine litter to preserve and protect the living resources and the marine environment | UNEA:<br>Member States have agreed at the international level to the “long-term elimination of discharge of litter and microplastics to the oceans and of avoiding detriment to marine ecosystems and the human activities dependent on them from marine litter and microplastics”, as stated by the United Nations Environment Assembly in its resolution 3/7 (UNEP/EA.4/6).<br><br>UNCLOS:<br>States have the obligation to protect and preserve the marine environment (Art. 192).<br><br>States shall take, individually or jointly as appropriate, all measures consistent with UNCLOS that are necessary to prevent, reduce and control pollution of the marine environment from any source, using for this purpose the best practicable means at their disposal and in accordance with their capabilities, and they shall endeavour to harmonise their policies in this connection. States shall take all measures necessary to ensure that activities under their jurisdiction or control are so conducted as not to cause damage by pollution to other States and their environment, and that pollution arising from incidents or activities under their jurisdiction or control does not spread beyond |

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| | the areas where they exercise sovereign rights in accordance with UNCLOS (Art. 194 (1)-(2)). |
| To protect human health | Stockholm:<br>Determined to protect human health and the environment from the harmful impacts of persistent organic pollutants (Preamble, Art 1).<br><br>In regard with the precautionary principle, if the chemical is likely as a result of its long-range environmental transport to lead to significant adverse human health and/or environmental effects such that global action is warranted, the proposal shall proceed. Lack of full scientific certainty shall not prevent the proposal from proceeding. (Stockholm art 8 (7))<br><br>London Convention:<br>Contracting Parties shall individually and collectively promote the effective control of all sources of pollution of the marine environment, and pledge themselves especially to take all practicable steps to prevent the pollution of the sea by the dumping of waste and other matter that is liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea (Art 1). |
| To prevent pollution from discharge of operational waste from ships | UNCLOS:<br>The measures taken shall deal with all sources of pollution of the marine environment. These measures shall include, inter alia, those designed to minimize to the fullest possible extent:<br>… (b) pollution from vessels, ... , preventing intentional and unintentional discharges, and regulating the design, construction, equipment, operation and manning of vessels;<br>… (d) pollution from other installations and devices operating in the marine environment (Art 194 (3)).<br><br>MARPOL Annex V:<br>The disposal into the sea of all plastics, including but not limited to synthetic ropes, synthetic fishing nets, plastic garbage bags and incinerator ashes from plastic products which may contain toxic or heavy metal residues, is prohibited. (Reg. 3 (2)). |
| To control and prevent pollution of the oceans by dumping | UNCLOS:<br>States shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment by dumping.<br>National laws, regulations and measures shall be no less effective in preventing, reducing and controlling such pollution than the global rules and standards. (UNCLOS art 210 (1, 6)).<br><br>London Protocol<br>Contracting Parties shall prohibit the dumping of any wastes or other matter with the exception of those listed in relevant annexes of the London Protocol (Art 4). |
| To prevent harm to biodiversity from pollution in marine and coastal areas | CBD:<br>Contracting parties determined to conserve and sustainably use biological diversity for the benefit of present and future generations (CBD preamble)<br>The objectives of CBD are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. (CBD art 1)<br>Contracting Parties shall as far as appropriate adopt measures relating to the use of biological resources to avoid or minimise adverse impacts on biodiversity (CBD Art. 10). |
| To minimise the risk of long-term or irreversible effects of fishing operations | UN Fish Stocks Agreement:<br>In order to conserve and manage straddling fish stocks and highly migratory fish stocks, coastal States and States fishing on the high seas shall, in giving effect to their duty to cooperate in accordance with UNCLOS, (1) ensure that such measures are based on the best scientific evidence available and are designed to maintain or restore stocks at levels capable of producing maximum sustainable yield, (2) minimise pollution, waste, |

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| | discards, catch by lost or abandoned gear, catch of non-target species, and (3) protect biodiversity in the marine environment. (Art 5 (b)(f)(g)).<br><br>FAO Code of Conduct:<br>Fisheries management should promote the maintenance of the quality, diversity and availability of fishery resources in sufficient quantities for present and future generations in the context of food security, poverty alleviation and sustainable development. Management measures should not only ensure the conservation of target species but also of species belonging to the same ecosystem or associated with or dependent upon the target species (Art 6.2). |
| To take relevant action in response to climate change | Paris Agreement:<br>To strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, Parties to the Paris Agreement take actions including holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognising that this would significantly reduce the risks and impacts of climate change… The Paris Agreement will be implemented to reflect equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances (Art 2). |

## Operational targets

Setting out instructive operational targets is critical in evaluating the contribution to the overall goal of prevention and reduction of litter and microplastics in the oceans. Where possible and appropriate, operational targets should be measurable and timebound. These should also address the full life cycle of upstream, midstream and downstream activities, with a focus on prevention. Examples of operational targets from complementary international instruments are provided as a basis for the design of a new international framework.

Examples of Upstream Operational Targets

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| Reduce waste generation | Each Party shall take the appropriate measures to ensure that the generation of hazardous wastes and other wastes within it is reduced to a minimum, taking into account social, technological and economic aspects (Basel Convention, Art. 4 (a)).<br>To reduce or eliminate releases from intentional production and use of the listed chemicals in relevant annexes, each Party shall prohibit and/or take the legal and administrative measures necessary to eliminate its product and use, import and export of the chemicals listed in relevant annexes (Stockholm Convention, Art. 3). |
| Promote use of BMP, BAT | The Parties to the Montreal Protocol shall co-operate, consistent with their national laws, regulations and practices and taking into account in particular the needs of developing countries, in promoting, directly or through competent international bodies, research, development and exchange of information on best technologies for improving the containment, recovery, recycling, or destruction of controlled substances or otherwise reducing their emissions. (Montreal Protocol, Art. 6(1)).<br>Each Party shall take every practicable step, consistent with the programmes supported by the financial mechanism, to ensure that the best available, environmentally safe substitutes and related technologies are expeditiously transferred to Parties operating under relevant articles. (Montreal Protocol, Art. 10(a)).<br><br>General prevention measures relating to both best available techniques and best environmental practices could include: (a) The use of low-waste technology; (b) The use of less hazardous substances; (c) The promotion of the recovery and recycling of waste and of substances generated and used in a process… (Stockholm Convention Part V-A (a)-(c)) |

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| | Paris Agreement recognises the need for an effective and progressive response to the urgent threat of climate change on the basis of the best available scientific knowledge. (Paris Preamble)<br>Parties to the Paris Agreement acknowledge that adaptation action should be based on and guided by the best available science. (PA art 7)<br><br>Strategies to prevent and manage at-sea sources of marine debris focus on areas including developing and promoting best practices (Honolulu Strategy) |
| Design of products | Develop and promote the application of BMPs for fishing gear design, deployment, handling, and maintenance in order to minimize or reduce the probability of accidental gear loss at sea (Honolulu Strategy B3)<br>New technologies, including fishing gear that minimises accidental loss and facilitates location and recovery of ALDFG for gear disposal in port (Honolulu Strategy B1)<br>Expand and encourage participation in pellet control programs, such as Operation Clean Sweep (Honolulu Strategy Goal A)<br>Promote research on the production of truly biodegradable polymers that meet ASTM standards for biodegradation in the marine environment (Honolulu Strategy) |
| Microplastics | Research on the evaluation of biodegradable plastic process outcomes and the relation to the creation of microplastics (Honolulu Strategy) |
| Research | Parties to the Stockholm Convention shall within their capabilities, at the national and international levels, encourage and/or undertake appropriate research, development, monitoring and cooperation pertaining to persistent organic pollutants and, where relevant, to their alternatives and to candidate persistent organic pollutants, including on their presence, levels and trends in humans and the environment and effects on human health and the environment. (Stockholm art 11 (1)). |

Examples of Midstream Operational Targets

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| Sustainable Waste Management | Basel Convention:<br>The Basel Convention points out that hazardous wastes and other wastes should, as far as is compatible with environmentally sound and efficient management, be disposed of in the State where they were generated (Preamble).<br>It promotes environmentally sound management of hazardous wastes or other wastes as methods that take 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 (Art. 2(8)).<br>Parties shall take the appropriate measures to ensure the availability of adequate disposal facilities, for the environmentally sound management of hazardous wastes and other wastes, that shall be located, to the extent possible, within it, whatever the place of their disposal (Art 4(2)(a)). |
| Stockpiles | Stockholm:<br>Manage stockpiles, as appropriate, in a safe, efficient and environmentally sound manner (Art. 6(1)(c)).<br>Not permit disposal operations that may lead to recovery, recycling, reclamation, direct reuse or alternative uses of persistent organic pollutants (Art. 6(1)(d.iii)).<br>General prevention measures relating to both best available techniques and best environmental practices could include: (c) The promotion of the recovery and recycling of waste and of substances generated and used in a process… (Stockholm Convention Part V-A(c)). |
| "4Rs" | Honolulu Strategy<br>Develop and implement an education campaign to increase recycling and proper disposal efforts (Goal A1).<br>Employ infrastructure and implement best practices for improving stormwater management and reducing discharge of solid waste into waterways (Goal A3).<br>Promote economic incentives for recycling and composting by encouraging governments to make recycling and composting more widely available and cost effective (Goal A). |

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| Use of BMP and BAT | Honolulu Strategy:<br>Develop and strengthen implementation of industry best management practices (BMP) designed to minimize abandonment of vessels and accidental loss of cargo, solid waste, and gear at sea (Goal B3). |

Examples of Downstream Operational Targets

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| Prevention | Priority should be given to the consideration of approaches to prevent the formation and release of the chemicals listed in relevant articles. Measures could include improvements in waste management with the aim of the cessation of open and other uncontrolled burning of wastes, including the burning of landfill sites. When considering proposals to construct new waste disposal facilities, consideration should be given to alternatives such as activities to minimise the generation of municipal and medical waste, including resource recovery, reuse, recycling, waste separation and promoting products that generate less waste. Under this approach, public health concerns should be carefully considered (Part V-A-f) |
| Dumping | London Protocol:<br>On incineration at sea, Contracting Parties to the London Protocol shall prohibit incineration at sea of wastes or other matter. (Art 5)<br>Each Contracting Party to the London Protocol shall at its discretion either apply the provisions of this Protocol or adopt other effective permitting and regulatory measures to control the deliberate disposal of wastes or other matter in marine internal waters where such disposal would be "dumping" or "incineration at sea" as defined in the London Protocol (Art. 7) |
| Garbage, including fishing gear | MARPOL Annex V:<br>On disposal of garbage outside special areas, subject to relevant regulations in Annex V: the disposal into the sea of all plastics, including but not limited to synthetic ropes, synthetic fishing nets, plastic garbage bags and incinerator ashes from plastic products which may contain toxic or heavy metal residues, is prohibited (Reg. 3 (2))<br>Subject to relevant regulations in Annex V, the discharge into the sea of any garbage is prohibited from fixed or floating platforms and from all other ships when alongside or within 500 m of such platforms (Reg. 5 (1)). |
| Use of BMP and BAT | Honolulu Strategy:<br>Develop conversion (e.g., biomass, ethanol) and waste-to-energy technologies (including BMPs to control air pollution) for utilization of complex materials to prevent landfilling and increase recovery of all material types, utilizing existing efforts as applicable.<br>Develop and promote BMPs by waste managers to improve waste management technical capacity and infrastructure. Promote and implement BMPs for the capture of trash in municipal stormwater systems, including the installation and maintenance of full trash-capture devices as well as the specific good housekeeping measures (street sweeping, trash hot spot identification and cleanup, and compliance assistance). Implement adequate technology and BMPs for stormwater debris control (Goal A).<br>Promote BMPs to encourage proper disposal of solid wastes (Strategy A3). |

#### 4.4.3.2 Management

**Local capacity building and development**

Lack of capacity and funding to effectively manage marine litter is a common problem for developing countries. Capacity building is therefore an essential element to ensure effective implementation of the international framework. At the international level, this should focus on building capacity for member parties to enforce, to monitor and to collaborate on marine litter issues. It also guides capacity building at regional and national levels as part of marine litter action plans. Examples of

capacity building measures from complementary international instruments are provided as a basis for the design of a new international framework.

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| Honolulu Strategy | … Lack of capacity and funding to effectively manage solid wastes is common, particularly in developing countries. Strategies to improve integrated solid waste management are needed to support marine debris prevention and management; however, that is beyond the scope of this document. Gaining capacity and identifying funding sources must be prioritised.<br><br>Capacity and jurisdictional issues often complicate or impede response to reports of marine debris accumulations. Training in safe and efficient location and removal methods, as well as improving co-management of marine debris removal, would increase the effectiveness of marine debris removal. Development and promotion of effective reporting systems and coordinated rapid response mechanisms would increase the efficiency of locating marine debris. Effective coordination among civil society, government, and the private sector would improve the response to and rate of removal of marine debris. (Strategy C3) |
| Montreal Guidelines 1985 | Section 9 on assistance to developing countries<br>States should, directly and/or through competent international organisations, promote programmes of assistance to developing countries in the fields of education, environmental and pollution awareness, training, scientific research and transfer of technology and know-how for the purpose of improving the capacity of the developing countries to prevent, reduce and control of pollution from land-based sources and to assess its effects on the marine environment.<br>Such assistance should include:<br>(i) Training of scientific and technical personnel;<br>(ii) Facilitation of the participation of developing countries in relevant international programmes;<br>(iii) Acquisition, utilization, maintenance and production by those countries of appropriate equipment; and<br>(iv) Advice on, and development of, facilities for education. |
| Minamata Convention | Article 10(4): Parties shall cooperate, as appropriate, with each other and with relevant intergovernmental organisations and other entities, to enhance capacity-building for the environmentally sound interim storage of such mercury and mercury compounds.<br>Article 13(3): Multilateral, regional and bilateral sources of financial and technical assistance, as well as capacity-building and technology transfer, are encouraged, on an urgent basis, to enhance and increase their activities on mercury in support of developing country Parties in the implementation of this Convention relating to financial resources, technical assistance and technology transfer. |

## Ongoing funding secured

The parties should decide on appropriate financial arrangements on a voluntary nature, including the establishment of funding mechanisms. States may collaborate to secure appropriate funding mechanism to assist developing States in implementation, for purposes of capacity building, technology transfer and scientific and research. Multiple-source funding approaches, mechanism and arrangements should be made accordingly. Examples of funding sources from complementary international instruments are provided as a basis for the design of a new international framework.

| LEGAL BASIS FOR A FINANCIAL MECHANISM | |
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| Montreal Protocol | Article 10 (1)-(2): The Parties shall establish a mechanism for the purposes of providing financial and technical co-operation, including the transfer of technologies, to Parties operating under paragraph 1 of Article 5 of the Montreal Protocol to enable their compliance with the control measures set out in Articles 2A to 2E and Article<br>2I, and any control measures in Articles 2F to 2H that are decided pursuant to paragraph 1 *bis* of Article 5 of the Montreal Protocol. The mechanism, contributions to which shall be additional to other financial transfers to Parties operating under that paragraph, shall meet all |

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| | agreed incremental costs of such Parties in order to enable their compliance with the control measures of the Protocol. An indicative list of the categories of incremental costs shall be decided by the meeting of the Parties.<br>2. The mechanism established under paragraph 1 shall include a Multilateral Fund. It may also include other means of multilateral, regional and bilateral co-operation. |
| Stockholm Convention | Article 13:<br>1. Each Party undertakes to provide, within its capabilities, financial support and incentives in respect of those national activities that are intended to achieve the objective of this Convention in accordance with its national plans, priorities and programmes.<br>2. The developed country Parties shall provide new and additional financial resources to enable developing country Parties and Parties with economies in transition to meet the agreed full incremental costs of implementing measures which fulfill their obligations under this Convention as agreed between a recipient Party and an entity participating in the mechanism described in paragraph 6. Other Parties may also on a voluntary basis and in accordance with their capabilities provide such financial resources. Contributions from other sources should also be encouraged. The implementation of these commitments shall take into account the need for adequacy, predictability, the timely flow of funds and the importance of burden sharing among the contributing Parties. |

| FUNDING FOR DEVELOPING COUNTRIES | |
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| FAO Voluntary Guidelines for the Marking of Fishing Gear | Para 70. States may cooperate to establish appropriate funding mechanisms to assist developing States to implement these Guidelines. These mechanisms may be directed specifically towards developing and enhancing the capacity of the States to implement these Guidelines, and may include technical and financial assistance. |
| Stockholm Convention | Article 11(2)(c): Take into account the concerns and needs, particularly in the field of financial and technical resources, of developing countries and countries with economies in transition and cooperate in improving their capability to participate in the efforts referred to in subparagraphs (a) and (b). |

| MULTIPLE-SOURCE FUNDING APPROACHES, PRIVATE SECTOR | |
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| Stockholm Convention | Pursuant to the objectives of the Stockholm Convention and paragraph 6, the Conference of the Parties shall at its first meeting adopt appropriate guidance to be provided to the mechanism and shall agree with the entity or entities participating in the financial mechanism upon arrangements to give effect thereto. The guidance shall address, inter alia … (c) The promotion of multiple-source funding approaches, mechanisms and arrangements. |
| Paris Agreement | Article 9 (4) As part of a global effort, developed country Parties should continue to take the lead in mobilizing climate finance from a wide variety of sources, instruments and channels, noting the significant role of public funds, through a variety of actions, including supporting country-driven strategies, and taking into account the needs and priorities of developing country Parties. Such mobilization of climate finance should represent a progression beyond previous efforts. |
| Honolulu Strategy | Develop cooperation mechanisms to leverage human and financial resources to respond to reports of marine debris to reduce amount and impact of accumulated marine debris on shorelines, in benthic habitats, and in pelagic waters. |

## Monitoring

Monitoring supports a responsive international framework for the changing conditions of stakeholders of the whole plastic value chain. In the proposed international framework for marine litter, monitoring happens at different levels. At the international level, cooperation on standardising monitoring methods is emphasised. At the regional level, regional data collection and sharing is essential as it can assist regional States by providing scientific information and statistics of marine

litter. At the national and local level, monitoring is closely linked with the enforcement of legislation and regulations.

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| Monitoring of adverse impacts | CBD:<br>To achieve the purposes of relevant articles in the CBD, Contracting Parties to the CBD shall identify processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity, and monitor their effects through sampling and other techniques. (CBD art 7 (c)) |
| Monitoring of implementation | Montreal Protocol:<br>The Parties shall establish an Executive Committee to develop<br>and monitor the implementation of specific operational<br>policies, guidelines and administrative arrangements,<br>including the disbursement of resources, for the purpose of achieving the objectives of the Multilateral Fund. |
| International Cooperation on Monitoring | Basel Convention:<br>Article10: Parties shall co-operate in monitoring the effects of the management of hazardous wastes on human health and the environment; |
| Multiple impacts including socio-economic and cultural impacts | Stockholm Convention:<br>The Parties shall, within their capabilities, at the national and international levels, encourage and/or undertake appropriate research, development, monitoring and cooperation pertaining to persistent organic pollutants and, where relevant, to their alternatives and to candidate persistent organic pollutants, including on their:<br>(a) Sources and releases into the environment;<br>(b) Presence, levels and trends in humans and the environment;<br>(c) Environmental transport, fate and transformation;<br>(d) Effects on human health and the environment;<br>(e) Socio-economic and cultural impacts;<br>(f) Release reduction and/or elimination; and<br>(g) Harmonized methodologies for making inventories of generating sources and analytical techniques for the measurement of releases. |
| Monitoring indicators for strategy effectiveness | Honolulu Strategy:<br>Potential evaluation questions and indicators are provided as an evaluation approach for strategies to achieve its three goals. Examples: the percentage of fishers who think current practices and methods to prevent ALDFG sources are adequate by fishing fleet or area, number of gear items lost, tonnage of gear lost , cost of lost gear and amount of marine debris removed |
| Monitoring for better compliance | FAO Code of Conduct:<br>7.1.7 States should establish, within their respective competences and capacities:<br>Effective mechanisms for fisheries monitoring, surveillance, control and<br>enforcement to ensure compliance with their conservation and management measures, as well as those adopted by subregional or regional organisations or arrangements. |

## Reporting

Progress reports regarding implementation situations and future action are to be submitted by States on a regular basis. States are to report on measures taken to combat marine litter and their effectiveness and difficulties in meeting the international objectives.

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| Report on actions taken, work progress and support for other countries | Paris Agreement, Article 13:<br>(7) Each Party shall regularly provide the following information:<br>(a) A national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases, prepared using good practice methodologies accepted by the Intergovernmental Panel on Climate Change and agreed upon by the Conference of the Parties serving as the meeting of the Parties to this Agreement; and (b) Information |

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| | necessary to track progress made in implementing and achieving its nationally determined contribution under<br>(8) Each Party should also provide information related to climate change impacts and adaptation under Article 7, as appropriate.<br>(9) Developed country Parties shall, and other Parties that provide support should, provide information on financial, technology transfer and capacity-building support provided to developing country Parties under Articles 9, 10 and 11. |
| Reporting on data | Montreal Protocol, Article 7(3):<br>Each Party shall provide to the Secretariat statistical data on its annual production (as defined in paragraph 5 of Article 1) of each of the controlled substances listed in Annexes A, B, C and E and, separately, for each substance, -amounts used for feedstocks, – amounts destroyed by technologies approved by the Parties, and – imports from and exports to Parties and non-Parties respectively. |
| Report on measures taken | Stockholm Convention, Article 15:<br>1. Each Party shall report to the Conference of the Parties on the measures it has taken to implement the provisions of this Convention and on the effectiveness of such measures in meeting the objectives of the Convention.<br>2. Each Party shall provide to the Secretariat:<br>(a) Statistical data on its total quantities of production, import and export of each of the chemicals listed in Annex A and Annex B or a reasonable estimate of such data; and<br>(b) To the extent practicable, a list of the States from which it has imported each such substance and the States to which it has exported each such substance.<br>3. Such reporting shall be at periodic intervals and in a format to be decided by the Conference of the Parties at its first meeting. |
| | CBD, Article 26. Reports<br>Each Contracting Party shall, at intervals to be determined by the Conference of the Parties, present to the Conference of the Parties, reports on measures which it has taken for the implementation of the provisions of this Convention and their effectiveness in meeting the objectives of this Convention. |

## Evaluation and review

Evaluation and review are to be conducted on a regular basis, on issues including global marine litter status, implementation situations and amendments of the international framework will be made accordingly.

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| Review of implementation | CBD, Article 23:<br>The Conference of the Parties shall keep under review the implementation of this Convention, and, for this purpose, shall:<br>(a) Establish the form and the intervals for transmitting the information to be submitted in accordance with Article 26 and consider such information as well as reports submitted by any subsidiary body:<br>(b) Review scientific, technical and technological advice on biological diversity provided in accordance with Article 25…<br><br>Paris Agreement, Article 14:<br>(1) The Conference of the Parties serving as the meeting of the Parties to this Agreement shall periodically take stock of the implementation of this Agreement to assess the collective progress towards achieving the purpose of this Agreement and its long-term goals. It shall do so in a comprehensive and facilitative manner, considering mitigation, adaptation and the means of implementation and support, and in the light of equity and the best available science. (3) The outcome of the global stocktake shall inform Parties in updating and enhancing, in a nationally determined manner, their actions and support in accordance with the relevant provisions of this Agreement, as well as in enhancing international cooperation for climate action |

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| Assessment and review of control measures | Montreal Protocol, Article 6:<br>At least every four years, the Parties shall assess the control measures provided for in Article 2 and Articles 2A to 2I on the basis of available scientific, environmental, technical and economic information. At least one year before each assessment, the Parties shall convene appropriate panels of experts qualified in the fields mentioned and determine the composition and terms of reference of any such panels. Within one year of being convened, the panels will report their conclusions, through the Secretariat, to the Parties. |

#### 4.4.3.3 Co-operation:

### Domestic stakeholders included

At the international level, domestic public participation and stakeholder participation should be promoted as a principle. A network from international coordination centre to national focal points and local nodes could be established.

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| Awareness raising for fishers | FAO Code of Conduct:<br>States, recognising the paramount importance to fishers and fishfarmers of understanding the conservation and management of the fishery resources on which they depend, should promote awareness of responsible fisheries through education and training. They should ensure that fishers and fishfarmers are involved in the policy formulation and implementation process, also with a view to facilitating the implementation of the Code (para 6.16). |
| Awareness raising for the public | Montreal Protocol:<br>The Parties, individually, jointly or through competent international bodies, shall co-operate in promoting public awareness of the environmental effects of the emissions of controlled substances and other substances that deplete the ozone layer (Art. 9(2)). |
| Outreach on negative impacts from marine litter | Honolulu Strategy<br>Conduct ocean-user education and outreach on marine debris impacts, prevention, and management (Strategy B1). |

### International capacity building

Cooperation on international capacity building emphasises the assistance to developing countries, specifically on aspects including technical assistance, technology transfer, training and scientific research.

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| Cooperation among enclosed and semi-enclosed sea coastal States | UNCLOS, Article 123:<br>States bordering an enclosed or semi-enclosed sea should cooperate with each other in the exercise of their rights and in the performance of their duties under this Convention. To this end they shall endeavour, directly or through an appropriate regional organisation:<br>(a) to coordinate the management, conservation, exploration and exploitation of the living resources of the sea;<br>(b) to coordinate the implementation of their rights and duties with respect to the protection and preservation of the marine environment… |
| North-South Cooperation | Paris Agreement, Article 7:<br>(1) Parties hereby establish the global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature goal referred to in Article 2… (6) Parties recognize the importance of support for and international cooperation on adaptation efforts and the importance of taking into account the needs of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change. |

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| Technical assistance | Stockholm Convention, Article 12:<br>(1) The Parties recognize that rendering of timely and appropriate technical assistance in response to requests from developing country Parties and Parties with economies in transition is essential to the successful implementation of this Convention… (3) In this regard, technical assistance to be provided by developed country Parties, and other Parties in accordance with their capabilities, shall include, as appropriate and as mutually agreed, technical assistance for capacity-building relating to implementation of the obligations under this Convention. Further guidance in this regard shall be provided by the Conference of the Parties… (5) The Parties shall, in the context of this Article, take full account of the specific needs and special situation of least developed countries and small island developing states in their actions with regard to technical assistance. |

#### 4.4.3.4 Co-benefits:

**Environmental**

As combating marine litter is the aim of this international framework, environmental benefits would be the most relevant positive outcomes of its implementation.

**Social**

With changes in different life cycles and finally achieving a circular economy, threats posed on public health, as well as aesthetic and cultural values could be gradually prevented and reduced. In addition, knowledge of marine litter and its negative impacts on different sectors of society will be disseminated and better understood.

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| CBD | Preamble: The CBD emphasises the intrinsic value of biological diversity and of the ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic values of biological diversity and its components. |
| Honolulu Strategy | Marine debris is a complex cultural and multi-sectoral problem that exacts tremendous ecological, economic, and social costs around the globe.<br>Plastic and other solid waste from land-based and at-sea sources, lost cargo, ALDFG, and abandoned or derelict vessels directly and negatively impact coastal and marine species and habitats, economic health, human health and safety, and social values. |
| Stockholm Convention | Article 1: Mindful of the precautionary approach as set forth in Principle 15 of the Rio Declaration on Environment and Development, the objective of this Convention is to protect human health and the environment from persistent organic pollutants. |

**Economic**

By recognising direct relationships between marine litter, environment, human health, economic development, social wellbeing and food security, the international framework for marine litter could encourage closer collaboration between the public and private sectors, develop sustainable businesses by promoting product sustainability, stimulate the market for sustainable products, and create recruitment opportunities in the green industry. A better environment provides more opportunities for directly related industries including fisheries, aquaculture and tourism. Gender equality and social justice for women, migrants and underdeveloped communities who are exposed to high risk of harm and exploitation from marine litter could be advanced.

| | |
|---|---|
| Honolulu Strategy | (1) Marine debris has numerous economic implications, which should be considered when developing strategies and policies to mitigate the issue. Negative effects associated with marine debris can ripple throughout a local economy. Marine debris can cause a broad spectrum of economic impacts that reduce the economic benefits derived from marine and coastal activities and/or increase the costs associated with them (National Research Council 2008). |

| | |
|---|---|
| | (2) For instance, ALDFG continues to catch, injure, and kill ocean life in a process known as "ghost fishing." Although the amount and extent of loss varies, ghost fishing adversely impacts fishing industries. All lost and abandoned gear can continue capturing economically important fish, crabs, and lobster in addition to non-commercial fish and shellfish species. With populations down, commercial fisheries can suffer economic losses and recreational fishing opportunities can decrease (Macfadyen et al. 2009). |
| APEC Marine Debris Roadmap | APEC: to increase access to financing and facilitating private sector engagement to promote investment, trade and market creation in industries and activities that enable marine debris management and prevention. |
| G20 Framework | To promote the socio-economic benefits of establishing policies to prevent marine litter as one of its areas of prior concern and potential policy measures |
| ASEAN Framework of Action on Marine Debris | (1) to encourage national authorities in collaboration with businesses to develop and promote product sustainability and circularity criteria to stimulate the market for sustainable products and secondary raw materials;(2) to promote private sector investment in redesigning products/packaging and alternative materials; (3) to engage value chain stakeholders to establish enabling mechanisms /infrastructure to increase waste recovery and recycling rates |

## 4.4.4 Performance Indicators

The design of a potential international framework to combat marine litter and microplastics must include consideration of methods to measure effectiveness of the management strategy in preventing leakage of waste into the environment. Examples of outcomes from existing international instruments are highlighted for consideration in the design of the desired outputs of a potential new international framework.

### 4.4.4.1 Outputs

#### 4.4.4.1.1 Outputs for life cycle phase 1: Source materials

The effectiveness of a potential new international framework in the life cycle phase of source materials can be measured by the possible outputs relevant to this phase that would assist in harmonising action at the national and regional levels. Table 11 highlights examples from existing instruments and research relevant to this role.

*Table 11: Examples of existing outputs relevant to an international framework for the cycle phase of source materials*

| Output indicator | Example of outputs |
|---|---|
| Guidelines for the development of National Action Plans | • The contents of NAPs may be defined to provide the minimum elements to be included. Examples include Annex C of the **Minamata Convention** for artisanal and small-scale gold mining:<br>1. Each Party that is subject to the provisions of paragraph 3 of Article 7 shall include in its national action plan: National objectives and reduction targets; Actions to eliminate listed chemicals; Steps to facilitate the formalization or regulation of the sector; Baseline estimates; Strategies for promoting the reduction of emissions and releases; Strategies for managing trade; Strategies for involving stakeholders in the implementation and continuing development of the national action plan; A public health strategy on the exposure of artisanal and small-scale gold miners and their communities to mercury; Strategies to prevent the exposure of vulnerable populations; Strategies for providing information to affected communities; and A schedule for the implementation of the national action plan.<br>2. Each Party may include in its national action plan additional strategies to achieve its objectives, including the use or introduction of standards and market-based mechanisms or marketing tools. Guidelines for the Development of Action Plans on Marine Litter (UNEP, 2019) |

| | |
|---|---|
| | • Honolulu Strategy. A Global Framework for Prevention and Management of Marine Debris (Honolulu Strategy, 2011)<br>• Montreal Guidelines for the Protection of the Marine Environment against Pollution from Land-based Sources (Montreal Guidelines, 1985).<br>• Marine plastic debris and microplastics – Global lessons and research to inspire action and guide policy change (UNEP, 2016b). |
| Stakeholder platform | • UN Environment Assembly – intergovernmental, major groups and stakeholders.<br>• Global Partnership on Marine Litter[24]<br>• European Circular Economy Stakeholder Platform [25] provides a mechanism for contributions of good practice, publications, etc., engage with other stakeholders and subscribe to ongoing activity notifications. National action plans, strategies and commitments are available. |
| Capacity building | • CBD: NBSAP Capacity Building Modules.<br>A second series of capacity building modules on National Biodiversity Strategies and Action Plans has been developed, aimed at National Focal Points of the convention.[26]<br>A number of capacity building workshops have been held on the design and implementation of NBSAPs.[27] |

#### 4.4.4.1.2 Outputs for life cycle phase 2: Product manufacture

The effectiveness of a new international framework within the life cycle phase of **product manufacture** can be measured by the outputs that assist in harmonising global action relevant to this phase. Table 12 highlights existing examples relevant to this role.

*Table 12: Examples of existing outputs relevant to an international framework for the cycle phase of product manufacture*

| Output indicator | Example of outputs |
|---|---|
| Subsidiary body | • Implementation of the protocol is supported by three subsidiary bodies. The Technology and Economic Assessment Panel (TEAP) is an advisory body to the Parties and provides technical information on alternatives to ozone depleting substances.28 The Scientific Assessment Panel (SAP) assesses the status of the ozone layer.29 The Environmental Effects Assessment Panel (EEAP) assess the effects of depletion of the ozone layer and is peer reviewed.30<br>• The European Chemicals Agency (ECHA) is supported by two committees. The Committee for Socio-Economic Analysis (SEAC) provides opinion on ECHA's proposals, including potential costs to society, and determines transition periods for different product groups to give companies time to prepare. The Committee for Risk Assessment (RAC) prepares opinions on ECHA proposals on the risks of substances to human health and the environment.<br>• The Group of Chief Scientific Advisors provides independent scientific advice to the European Commission to inform policy making and makes recommendations to improve the interaction between policy-making and scientific advice.[31] |

[24] https://gpmarinelitter.org/
[25] https://circulareconomy.europa.eu/platform/en
[26] https://www.cbd.int/nbsap/training/
[27] https://www.cbd.int/nbsap/workshops/
[28] https://ozone.unep.org/science/assessment/teap
[29] https://ozone.unep.org/science/assessment/sap
[30] https://ozone.unep.org/science/assessment/eeap
[31] https://ec.europa.eu/info/research-and-innovation/strategy/support-policy-making/scientific-support-eu-policies/group-chief-scientific-advisors_en

| | |
|---|---|
| Stakeholder platform | • The Global Partnership on Marine Litter (GPML) has established regional nodes in the Mediterranean, Northwest Pacific, Pacific, South Asia and the Wider Caribbean. [32] These platforms bring together multiple stakeholders, including government, industry, civil society, academia and other intergovernmental fora.<br>• The European Chemicals Agency (ECHA) provides a mechanism for stakeholder organisations to obtain accreditation and provide support through different bodies and networks. [33] A discussion platform is also provided for NGO participation.[34] |
| Guidelines and BEP | • Stockholm Convention, Part V: General guidance on best available techniques and best environmental practices. Useful measures could include:<br>use of low-waste technology; use of less hazardous substances; promotion of the recovery and recycling of waste and of substances generated and used in a process; replacement of feed materials; good housekeeping and preventive maintenance programmes; minimization of these chemicals as contaminants in products.<br>• Policy Approaches to Incentivise Sustainable Plastic Design (OECD, 2019b).<br>• Options for designing sustainable plastics from a chemicals perspective are provided in Technical Tools and Approaches in the Design of Sustainable Plastics Background Paper 2 (OECD, 2018).<br>• Addressing the challenge of Marine Plastic Litter using Circular Economy methods (UNIDO, 2019).<br>• Investigating options for reducing releases in the aquatic environment of microplastics emitted by (but not intentionally added in) products (Eunomia, 2018) |
| Capacity building | • InforMEA - information on Multilateral Environmental Agreements, including chemicals and waste.[35]<br>• The Maritime Knowledge Centre (MKC) of the International Maritime Organization (IMO) provides collections, information resources and services to support the IMO Secretariat, Member States, representatives and delegates.[36] |

#### 4.4.4.1.3 Outputs for life cycle phase 3: Use

The effectiveness of a potential new international framework in the life cycle phase of use can be measured by the possible outputs relevant to this phase that would assist in harmonising action at the national and regional levels. Table 13 highlights examples from existing instruments and research relevant to this role.

*Table 13: Examples of existing outputs relevant to an international framework for the cycle phase of use*

| Output indicator | Example of outputs |
|---|---|
| Stakeholder platform | • The One Planet Network provides a platform to engage actors from all regions and sectors to share and consolidate expertise, resources, innovation and commitment for more sustainable modes of production and consumption. [37] |
| Guidelines and BEP | • ABC of SCP. Clarifying Concepts on Sustainable Consumption and Production (UNEP, 2010). |

[32] https://www.gpmarinelitter.org/regional-nodes
[33] https://echa.europa.eu/about-us/partners-and-networks/stakeholders/cooperation-with-accredited-stakeholder-organisations
[34] https://echa.europa.eu/about-us/partners-and-networks/stakeholders/cooperation-with-accredited-stakeholders/ngo-echa-discussion-platform
[35] https://www.informea.org/
[36] http://www.imo.org/en/KnowledgeCentre
[37] https://www.oneplanetnetwork.org/about/what-Sustainable-Consumption-Production

| | |
|---|---|
| | • Promoting Sustainable Consumption. Good Practices in OECD Countries (OECD, 2008).<br>• Consumers International is a membership organisation for consumer groups around the world.[38] |
| Capacity building | • 10-Year Framework of Programmes on Sustainable Consumption and Production (10FYP) is a global framework of action aimed at enhancing international cooperation towards SCP, providing support for capacity building, including access to technical and financial assistance for developing countries.[39] |

#### 4.4.4.1.4 Outputs for life cycle phase 4: End-of-life

The effectiveness of a potential new international framework in the life cycle phase of end-of-life can be measured by the possible outputs relevant to this phase that would assist in harmonising action at the national and regional levels. Table 14 highlights examples from existing instruments and research relevant to this role.

*Table 14: Examples of existing outputs relevant to an international framework for the cycle phase of end-of-life*

| Output indicator | Example of outputs |
|---|---|
| Subsidiary body | • The Basel Convention established an Expert Working Group on ESM to develop and implement actions in the short-term and develop a work programme for additional items.[40]<br>• The Basel Convention Plastic Waste Partnership has established a working group and four project groups to oversee work undertaken by the Partnership. These project groups will progress work on 1) Plastic waste prevention and minimization, 2) Plastic waste collection, recycling and other recovery including financing and related markets, 3) Transboundary movements of plastic waste, 4) Outreach, education and awareness-raising.[41] |
| Stakeholder platform | • The Basel Convention established a Plastic Waste Partnership in 2019, which aims to "mobilise business, government, academic and civil society resources, interests and expertise to improve and promote the environmentally sound management (ESM) of plastic waste at the global, regional and national levels and to prevent and minimize its generation."[42] |
| Guidelines and BEP | • Basel Convention provides a number of tools for environmentally sound management of wastes: 1) Framework for the ESM of hazardous wastes and other wastes (decision BC-11/1).[43] Guidance for Parties and other stakeholders on ESM of hazardous and other wastes (ESM Toolkit).[44]<br>• COP-13 adopted Draft Guidance to assist Parties in developing efficient strategies for achieving the prevention and minimization of the generation of hazardous and other wastes and their disposal (decision BC-13/3), in which plastic waste was highlighted as a key waste stream; and welcomed Draft practical manuals on extended producer |

[38] https://www.consumersinternational.org/

[39] https://www.oneplanetnetwork.org/sites/default/files/10yfp_general_brochure_february_2017-.pdf

[40] http://www.basel.int/Implementation/CountryLedInitiative/EnvironmentallySoundManagement/ExpertWorkingGrouponESM/tabid/3617/Default.aspx

[41] http://www.basel.int/Implementation/Plasticwaste/PlasticWastePartnership/Projectgroupsandactivities/tabid/8410/Default.aspx

[42] http://www.basel.int/Implementation/Plasticwastes/PlasticWastePartnership/tabid/8096/Default.aspx

[43] http://www.basel.int/Portals/4/download.aspx?d=UNEP-CHW-COP.11-BC-11-1.English.pdf

[44] http://www.basel.int/Implementation/CountryLedInitiative/EnvironmentallySoundManagement/ESMToolkit/Overview/tabid/5839/Default.aspx

| | |
|---|---|
| | responsibility and financing systems for environmentally sound management (decision BC-13/2).<br>• Guidelines for National Waste Management Strategies. Moving from Challenges to Opportunities (UNEP/UNITAR, 2013).<br>• Guidelines for Framework Legislation for Integrated Waste Management (UNEP, 2016a).<br>• Revised technical guidelines for the environmentally sound management of used and waste pneumatic tyres (Basel Convention Secretariat, 2011).<br>• Technical guidelines for the identification and environmentally sound management of plastic wastes and for their disposal (Basel Convention Secretariat, 2002a).<br>• Technical Guidelines on Specially Engineered Landfill (Basel Convention Secretariat, 2002b).<br>• Stockholm Convention, Part V: General guidance on best available techniques and best environmental practices. Useful measures could include: Improvements in waste management with the aim of the cessation of open and other uncontrolled burning of wastes, including the burning of landfill sites. When considering proposals to construct new waste disposal facilities, consideration should be given to alternatives such as activities to minimize the generation of municipal and medical waste, including resource recovery, reuse, recycling, waste separation and promoting products that generate less waste. Under this approach, public health concerns should be carefully considered. |
| Capacity building | • Basel Convention has established a network of 14 Regional and Coordinating Centres for Capacity Building and Technology Transfer (BCRCs) to provide training and technology transfer regarding the management of hazardous and other wastes, as well as ways to minimise the generation of wastes.[45]<br>• The Basel Convention provides for a technical assistance plan for countries in need of assistance.[46] |

#### 4.4.4.1.5 Outputs for restorative controls

The effectiveness of a potential new international framework in the post-leakage phase can be measured by the outputs relevant to the harmonisation of monitoring methodologies. Table 15 highlights examples relevant to this role.

*Table 15: Examples of existing outputs relevant to an international framework for restorative controls*

| Output indicator | Example of outputs |
|---|---|
| Research | • Sources, fate and effects of microplastics in the marine environment: part two of a global assessment (GESAMP, 2016).<br>• Primary Microplastics in the Oceans: a global evaluation of sources (IUCN, 2017). |
| Guidelines and BEP | • Guidelines for the Monitoring and Assessment of Plastic Litter and Microplastics in the Ocean (GESAMP, 2019). |

#### 4.4.4.1.6 Outputs for monitoring and evaluation

The effectiveness of a potential new international framework in the post-leakage phase can be measured by the outputs relevant to the harmonisation of monitoring methodologies. Table 16 highlights examples relevant to this role.

[45] http://www.basel.int/Partners/RegionalCentres/Overview/tabid/2334/Default.aspx

[46] Decision BC-14/18. See http://www.basel.int/Implementation/Plasticwaste/Technicalassistance/tabid/8340/Default.aspx

*Table 16: Examples of existing outputs relevant to an international framework for monitoring and evaluation*

| Output indicator | Example of outputs |
|---|---|
| Research | • The Group of Chief Scientific Advisors (EU) has provided a scientific opinion recommending to "Initiate the development of consensual international definitions and standards for the measurement and monitoring of microplastic pollution and its impact on ecosystems and human health enabling: i) a globally-coherent picture of the nature and threats of microplastic pollution and, ii) clear, unambiguous technical prescriptions and criteria for regulatory measures, when these are needed development of International scientific standards and methodologies." (EU, 2019). |
| Guidelines and BEP | • Guidelines for the Monitoring and Assessment of Plastic Litter in the Ocean (GESAMP, 2019). |
| Determining baselines | • Losses to the environment across the value chain have been modelled for macro- and microplastics, which could form baselines against which global progress can be measured (UNEP, 2018d). |

#### 4.4.4.2 Outcomes

Quantitative indicators, including baseline information and monitoring indicators, for measuring outcomes could be adopted and put forward, with international, regional and national situations taken into consideration. A global clearinghouse could be established for information and statistic collection, sharing and analysis. This would facilitate the aggregation of national and regional data to inform reporting at the international level that tracks progress towards to global target of long-term elimination of discharge of litter and microplastics into the oceans.

##### 4.4.4.2.1 National and regional reporting

National and regional reporting, as discussed in the management strategy for regional marine litter action plans, can be aggregated at the international level to enable tracking of progress towards the global objective of eliminating discharge of marine litter and microplastics to the oceans. Other regional reporting mechanisms can contribute to this process, including regional waste management reports such as the Africa Waste Management Outlook (UNEP, 2018a).

##### 4.4.4.2.2 Global reporting

Global reporting can build on existing reporting mechanisms, including the Global Waste Management Outlook (UNEP/ISWA, 2015). Building a robust understanding of the value chain, the actors, consumption and production patterns and leakage rates will allow for the development of global targets against which progress can be measured at regular intervals. Reporting will enable identification of barriers, challenges and opportunities for assistance in working towards achievement of targets and goals.

### 4.4.5 Summary of Indicators

A new international framework is a potential response option to the global issue of marine litter and microplastics. Examples for management controls have been provided from existing global instruments and it is therefore not possible to provide a summary of indicators for this management strategy as the examples of indicative.

## 4.5 Conclusion

The role of a new international framework is to harmonise action across countries, where appropriate, allowing for tracking of progress at the global level. Capacity building is provided and guides the goals of the framework. The support of subsidiary bodies, particularly scientific bodies enables the identification and response to emerging and priority issues. The development of guidelines and sharing of best environmental practices, as well as establishment of stakeholder platforms, enhances the likelihood of effective implementation of policies and strategies towards sustainable consumption

and production, thereby reducing the possibility for leakage of wastes into the environment across the life cycle and sectors of the value chain.

# 5 Pilot 3: MICROPLASTICS

## 5.1 The Microplastics Management Strategy in Context

The three resolutions on marine litter adopted at the meetings of UNEA have explicitly included microplastics. The management strategy for microplastics assessed in this study operates within the national context. Guidance can be taken from regional tools, particularly research undertaken at the regional level and the development of guidelines and model policy and legislation.

The primary role of national instruments for the purposes of this study are reflected in Table 17, column 3.

*Table 17: Overview of the primary roles of responses at the international, regional and national levels*

| International | Regional | National |
|---|---|---|
| Harmonise action:<br>• global targets & commitments<br>• cooperation & capacity building<br>• track progress towards global targets | Facilitate action:<br>• guidance & knowledge building<br>• monitoring methodologies<br>• cooperation & capacity building<br>• track progress at regional level | Implement measures:<br>• national targets<br>• national policy & regulation<br>• stakeholder engagement<br>• data collection<br>• track progress at national level |

The primary actions reflected in Table 1 have guided the development of the microplastics management strategy and the assessment thereof.

## 5.2 Scope of the pilot

The pilot study focuses on key sources of microplastics found in the environment based on their higher contribution to the stock of microplastics (Eunomia, 2018; Qantis/EA, 2020). These include a selection of microplastics 1) lost during production processes, 2) intentionally added during manufacture (primary), and 3) microplastics resulting from abrasion during normal use of products (secondary). Table 18 summarises the selection of categories for analysis within the microplastics management strategy:

*Table 18: Categories selected for analysis within the microplastics management strategy*

| Pressure | Example | Relevant life cycle phase |
|---|---|---|
| Production losses | • pre-production pellets | life cycle phase – source material (includes recycling), product manufacture |
| Intentionally added | • microbeads in cosmetics | life cycle phase – product manufacture |
| Abrasion | • car tyres | life cycle phase – use |
| Abrasion | • synthetic textiles | life cycle phase – use, end-of-life |

All sources are collectively addressed in the post event mitigation controls and in the monitoring and evaluation activities. The controls assessed include:

- Operation Clean Sweep (pellet loss)
- Legislation to ban microbeads in cosmetics (Canada, USA)
- Voluntary phase out of microbeads (Australia)
- General microplastics management – EU, NOAAA.

The study does not assess secondary microplastics resulting from the breakdown of macroplastics already found in the environment. These are assessed under management strategies that target macroplastics.

## 5.3 Findings of the Bowtie Analysis

The Bowtie for the microplastics management strategy has been developed using measures adopted at the national level, supported by a literature review. These measures have been grouped into the life cycle phases they can influence and then further categorised into pressures, prevention controls, barriers, barrier controls, mitigative controls and restorative controls, as reflected in Figure 8.

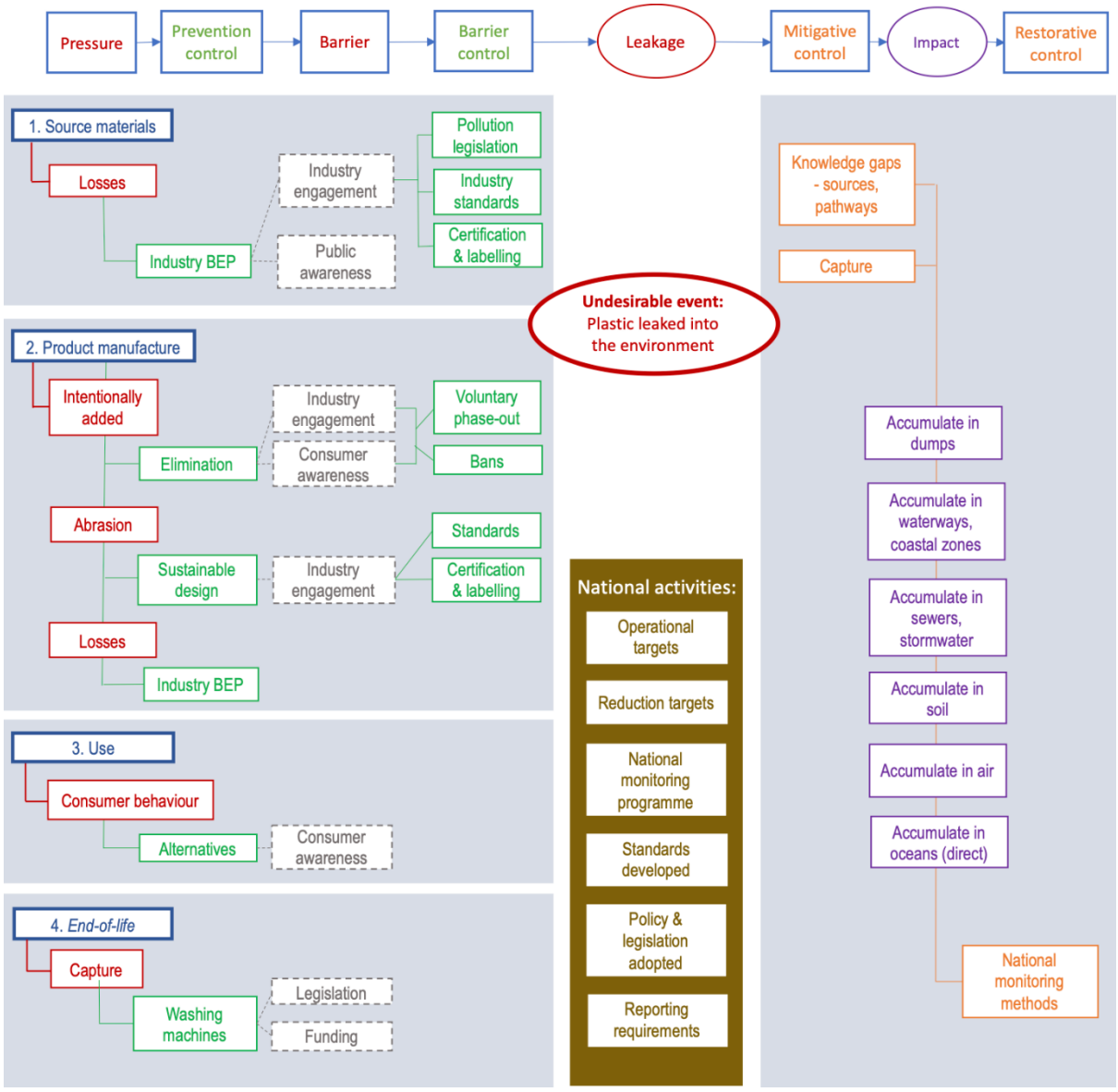


*Figure 8: Bowtie diagram of a national management strategy for microplastics*

### 5.3.1 Life Cycle Phase 1: Source Materials

Microplastics can be leaked into the environment at any point in the value chain up to and including the life cycle phase of manufacturing of plastic products and components (conversion). These industry

losses from facilities and transporters are preventable and therefore constitute a pressure (stressor) for the prevention of leakage into the environment.

#### 5.3.1.1 Pressure – Industry losses

Losses of microplastics by industry can result from spillage of pre-production pellets, powders and flakes during the production of pre-production pellets, the transport thereof and the recycling of end-of-life products back into pellets. The management controls for the minimisation of pellet loss at the pre-production phase would therefore apply in the life cycle phase of source materials.[47] The pilot study on regional marine litter action plans highlights efforts are underway to strengthen the program.

#### 5.3.1.2 Prevention control – Industry best practices

Operation Clean Sweep (OCS) is a voluntary product stewardship programme aimed at achieving zero pellet loss to the environment. Guidelines on best practices for the containment of resin pellets have been developed by industry[48] that apply to pellet producers and transporters. An enhanced version, OCS Blue, has also been developed which incorporates self-reporting annually on the number of incidents, including the volumes unrecovered beyond the boundary of the facility, of pellets, flakes and powders where the unrecovered volume for the incident is greater than 0.5 litres or 0.5 kilograms.[49]

#### 5.3.1.3 Barriers

Industry associations, such as PlasticsEurope, have actively promoted **industry engagement** in adoption of the OCS best practices. However, in many countries, and for smaller companies that are not members of active associations, awareness is likely to be low.

The loss of pellets to the environment is avoidable and should therefore be included in **public awareness** campaigns. Awareness and engagement by the public and NGOs can place pressure on producers and converters to comply with best practices towards zero pellet loss. The Great Nurdle Hunt is an example of awareness-through-action,[50] while NGOs have taken the initiative to introduce OCS in countries where it is not actively promoted by an industry association.[51]

#### 5.3.1.4 Barrier controls

| | |
|---|---|
| Industry standards | • Update current standards and best available techniques (bat) reference documents[52] to include OCS best practices, including as strengthened by work currently underway by OSPAR (OSPAR, 2018)(section 5.3.1, 7.1)<br>• Include implementation of OCS measures as a mandatory component of permits for pellet producers and transporters |
| Pollution legislation | • Include the prevention and control of pre-production pellets under industrial emissions regulations.<br>• Include pre-production pellets under regulations for preserving water quality standards, setting fines for emissions beyond a zero threshold. |
| Certification & labelling | • Establish certification programmes and labelling of pellets to indicate compliance and accreditation with industry best practices. |

[47] http://www.opcleansweep.eu/
[48] https://www.opcleansweep.org/
[49] https://www.opcleansweep.org/pledge/ocs-blue/
[50] https://www.nurdlehunt.org.uk/
[51] http://www.opcleansweep.org.au/
[52] See, for example, https://eippcb.jrc.ec.europa.eu/reference/production-polymers

## 5.3.2 Life Cycle Phase 2: Product Manufacture

### 5.3.2.1 Pressure – Intentionally added microplastics

Microbeads are spherical microplastics that are intentionally added during the manufacture of rinse-off personal care products for exfoliating and cleansing purposes. These products can include toothpaste to facial cleansers and scrubs, amongst others.

### 5.3.2.2 Prevention control – elimination

Microbeads can be considered an unnecessary and avoidable source of pollution from microplastics. Alternatives exist that are less harmful to the environment. When rinsed off, microbeads may be captured in wastewater treatment plants. If they make their way into the environment, removal processes are difficult and expensive. It is therefore widely agreed the addition of microbeads to cosmetic rinse-off products should be **eliminated**.

### 5.3.2.3 Barriers

The use of microbeads has been cheaper than alternatives such as various plant materials. **Industry engagement** has been low due to reluctance to include substitute materials, but support has increased over previous years.[53]

For many years, **public awareness** of the presence of microbeads in the products they purchased was very low. Awareness-raising campaigns have raised the profile of this pollutant and tools such as Beat the Microbead phone app have allowed consumers to check products for the inclusion of microbeads before purchasing.

### 5.3.2.4 Barrier controls

| | |
|---|---|
| Voluntary phase out | Public pressure has motivated companies such as Unilever, Proctor & Gamble and L'Oréal to begin voluntarily phasing out the use of microbeads. Such voluntary mechanisms can also be initiated and monitored by governments in place of, or before, introduction of legislation.<br>Governments can engage with industry to develop voluntary phase outs promoted and managed by industry, followed by legislation if the programme does not reach the agreed goals. |
| Pollution legislation | Legislation may prohibit the inclusion of microbeads in rinse-off personal care products, but definitions may exclude other non-rinse of personal care products. Non-cosmetic microbeads are often excluded, such as the industrial application in medicine, oil and gas exploration.[54] However, the European Chemicals Agency (ECHA) has a proposal in progress to include "consumer and professional products in multiple sectors, including cosmetic products, detergents and maintenance products, paints and coatings, construction materials and medicinal products, as well as various products used in agriculture and horticulture and in the oil and gas sectors."[55] |

[53] https://www.americanchemistry.com/Media/PressReleasesTranscripts/ACC-news-releases/Bipartisan-Legislation-to-Remove-Microbeads-from-Personal-Care-Products-Signed-into-Law.html

[54] https://www.bdlaw.com/publications/nationwide-ban-on-plastic-microbeads-in-cosmetics/

[55] https://echa.europa.eu/it/-/echa-proposes-to-restrict-intentionally-added-microplastics

#### 5.3.2.5 Pressure – Abrasion

There are multiple sources of microplastic release into the environment resulting from abrasion of products resulting from wear and tear during their intended use. These include automotive tyres, synthetic textiles resulting from wear, washing machines and dryers, road markings, artificial turf and fishing gear (De Falco et al., 2020; Eunomia, 2018).

#### 5.3.2.6 Prevention control – sustainable design

A full life cycle assessment should, in theory, consider the environmental impact across all life cycle phases, including use. The environmental performance of a product over its lifetime is largely determined at the design phase. The parameters that may affect the release of fibres from clothing include fibre length, yarn twist, linear density (yarn count), fabric density, textile auxiliaries.[56]

Development of design criteria for tyres to prevent abrasion may be based on standards already in place, such as ISO 9352:2012: Plastics — Determination of resistance to wear by abrasive wheels[57] and ASTM D4060 – 19: Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.[58]

#### 5.3.2.7 Barriers

**Industry engagement** is lacking due to little financial or regulatory incentive to design tyres with lower abrasion rates. Such design changes would also need to ensure safety and other performance criteria are maintained, but may also result in lower sales should tyres last longer as a result of the design enhancements (Eunomia, 2018).

### 5.3.2.8 Barrier controls

| | |
|---|---|
| Standards | • Include microplastics in water quality standards.<br>• Develop standard methods for the measurement of microplastic releases from textiles (Swanberg et al., 2019), tyres,[59] etc.<br>• Develop sustainability and performance criteria to incentivise product design that minimises release of microplastics during use.<br>• Develop performance criteria for washing machines and dryers to capture microplastics released from textiles (Swanberg et al., 2019). |
| Model policy, legislation and MBIs | • Develop certification and labelling schemes that provide transparency on content (e.g. use of plastic microbeads) and performance (e.g. rate of abrasion during intended use).<br>• Mandate the inclusion of capture devices in washing machines and dryers, supported by education on correct usage and disposal of captured fibers (Swanberg et al., 2019). |

#### 5.3.2.9 Pressure – Industry losses

Losses of pre-production pellets can result from the conversion of pellets into plastic products, and therefore linked to the life cycle phase of product manufacture. The barriers, barrier controls and outputs are similar to those applicable to source materials. Refer to prevention control – industry best practices under Life Cycle Phase 1 – Source materials.

[56] https://www.plasticsoupfoundation.org/wp-content/uploads/2017/08/Position-Paper.Microfiber-release-from-clothes-after-washing.PSF_.pdf
[57] https://www.iso.org/standard/55507.html
[58] https://www.astm.org/Standards/D4060.htm
[59] https://data.consilium.europa.eu/doc/document/ST-14649-2019-INIT/en/pdf

### 5.3.3 Life Cycle Phase 3: Use

The primary pressures in the use life cycle phase are **consumer behaviour** that lead to the selection of products with a higher abrasion rate or that contain intentionally added microplastics.

#### 5.3.3.1 Pressure – Consumer behaviour

Consumer choice is an important driver for product design change by industry. However, promotion of alternatives to polluting products is a controls that can alleviate this pressure, together with awareness of the issues and choices available to consumers, including reducing their use of polluting products.[60]

#### 5.3.3.2 Prevention control – Alternatives

The development of design criteria to minimise abrasion, together with standards for measuring the rate of abrasion and labelling schemes, will provide avenues for eliminating the worst performing from the market, either by incentivising design change or through prohibition. The provision of eco-friendly alternatives on the market (UNEP, 2018e) is important should prohibitions limit options for consumers, but also where market restrictions are not feasible.

#### 5.3.3.3 Barriers

A lack of **consumer awareness** of the issue of microplastic releases from various products will limit the uptake of alternatives, such as cotton textiles or tyres that cost more as a result of eco-design changes. It is therefore important that awareness campaigns inform users of the issues as well as the alternatives available.

### 5.3.4 Life Cycle Phase 4: End-Of-Life

The end-of-life phase for microplastics is the point at which they released from the original product. Because of their size, there are not many options available to consumers for responsible disposal. The pressure for this life cycle phase is therefore the challenges presented for capturing the microplastics at the point of release.

#### 5.3.4.1 Pressure - Capture

Capturing microplastics is usually labour intensive or expensive and few options exist. This life cycle phase examines washing machine filters as a method of capturing microplastics at the point of release.

#### 5.3.4.2 Prevention control – Washing machines

Various devices have been developed and tested for effectiveness in capturing microfibers released during the washing of synthetic textiles. These include the Guppy Friend,[61] the Cora Ball[62] and the Lint LUV-R filter (McIlwraith et al., 2019).

#### 5.3.4.3 Barriers

In most countries, there is **no legal requirement** to include filters in washing machine designs. The design of such regulations would need to consider who would bear the **cost of such installations**. It would also not incentivise improvements to the design of products, unless such costs could be transferred to the textile manufacturers (Swanberg et al., 2019). The European Parliament has

[60] https://theconversation.com/ten-stealth-microplastics-to-avoid-if-you-want-to-save-the-oceans-90063
[61] https://guppyfriend.com/
[62] https://coraball.com

suggested a requirement for the inclusion of filters could be mandated under the Ecodesign Directive (ECDPM, 2019).

### 5.3.5 Post Event Mitigation and Restoration

#### 5.3.5.1 Mitigation control – Knowledge gaps

Knowledge on the primary sources of microplastics has increased greatly over recent years (Connors et al., 2017). However, the solutions that best prevent each source are less well understood (Swanberg et al., 2019). This is particularly true for microfibres released from synthetic textiles. Research methods vary, further complicating comparison of the findings. For instance, studies have shown the shedding of microfibres and the ability for washing machine devices to capture them (McIlwraith et al., 2019) can be affected by different textile parameters (De Falco et al., 2020), including the porosity of the polymer (Browne et al., 2020), the type of washing machine (low water, front loader, top loader) (Lant et al., 2020), the washing powder and fabric softener used (Carney Almroth et al., 2018; De Falco et al., 2018; Pirc et al., 2016). It is therefore important that further research is conducted in this regard in order to inform effective policy interventions.

#### 5.3.5.2 Mitigation control - Capture

Capture of microplastics once they have left the source are mostly limited to wastewater treatment plants. It is estimated that municipal wastewater treatment facilities are the most significant pathway for microplastics to enter the marine environment (McCormick et al., 2014) and therefore the most effective point of capture.

It is further estimated that sewage treatment processes can retain approximately 90% of microplastics, accumulating them in sludge (Carr et al., 2016). This sludge may then be used as fertiliser, releasing between 0.2 and 8 milligrams of microplastics per hectare per inhabitant to agricultural soils in Europe annually. This practice is therefore to be avoided. Germany is working towards prohibiting the use of sewage sludge as fertiliser (Stubenrauch and Ekardt, 2020). The Group of Chief Scientific Advisors has recommended that policy at the EU level be broadened to include prevention and reduction of microplastic pollution in water, air and soil (EU, 2019).

## 5.4 Findings of Analysis of Indicators

### 5.4.1 Introductory overview

The **primary objective** of management strategies for microplastics are the elimination of discharge or reduction to a minimum. The instruments are generally binding, with some voluntary programmes agreed with industry. **Actions** include those of a preventive and mitigative nature, but also monitoring & evaluation. The **geographic range** is predominantly land-based. **Environmental zones** targeted for protection are marine areas and freshwater environments that lead to the oceans, with emerging recognition of soil and air pollution (Dris et al., 2017; Dris et al., 2016; Evangeliou et al., 2020; Kay et al., 2018; Stubenrauch and Ekardt, 2020).

## 5.4.2 Input Indicators

### 5.4.2.1 Scope

The management strategy for microplastics has a **national** scope, often defined within legal instruments. With regard to EU Directives, as they are binding on the EU Member States, they are taken into consideration of this pilot.

### 5.4.2.2 Maturity

National controls for microplastics have been taken by States for varied timelines. With the increasing recognition of the importance of controls to reduce the release of microplastics in recent decades, with examples found in national action plans, the maturity of the concept is regarded as **medium.**

### 5.4.2.3 Scale

The adoption and implementation of controls for microplastics is mostly limited to a small range of microbeads, constituting a small component of the total releases, the scale of these strategies is **low**.

## 5.4.3 Process Indicators

### 5.4.3.1 Governance:

The management target/s reflect the high-level objective of the national management strategies to achieve good outcomes in combating microplastics in the environment. The operational targets support the achievement of the higher-level management target/s.

#### 5.4.3.1.1 Management targets

The overarching management targets adopted by States or suggested by professional international organisations (Operation Clean Sweep, for instance) include quantitative and qualitative values. No overall management targets have been set for microplastics in general, but some targets have been set for individual sources, particularly microbeads in cosmetics.

#### 5.4.3.1.2 Operational targets

Some operational measures are adopted or suggested to achieve high-level management targets.
Few targets have been set due to a need for further research. Examples of operation targets include:

- As the leading program for combating microplastic pollution by pre-production pellets, Operation Clean Sweep aspires to achieve zero pellet loss.
- Where microbeads are prohibited, the operational target is set at zero leakage.
- As required in the Australian voluntary phasing-out of microbeads from rinse-off cosmetic, personal care and cleaning products, the phasing-out should be completed by no later than 1 July 2018. Environment Ministers stated that if the voluntary phase-out was not effective, they would move to implement a ban.

### 5.4.3.2 Management

**Local capacity building and development**

States recognise the importance of adequate and effective capacity building and development programmes to enhance the outcomes of the implementation of management strategy for microplastics. Increasing investment in research and development in areas directly relevant to achieving the goals of combating microplastics, as well as developing networks among different stakeholders are commonly targeted in national action plans. For example:

- For a better understanding of the Microbeads in Toiletries Regulations in Canada, the government provides retailers with useful information through pre-recorded webinar and information sheets.[63]
- For better understanding and implementation of the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) of EU, European Chemical Agency organised stakeholder workshop on intentional uses of microplastic particles.[64]
- With the OCS project, PlasticsEurope organised an OCS workshop in 2018; national plastics associations will be involved to encourage the organisation of OCS workshops at the local level.[65]

**Ongoing funding secured**

Sufficient funding remains an essential element to ensure promising outcomes of national management strategies for microplastics. Sectors including product design, research and development, awareness raising are funded by national governments in practice. For example:

- To better understand marine debris including microplastics, the NOAA Marine Debris Program funds research projects across the United States for projects including its sources, its movement in the environment and impacts on the environment and economy (Program, 2019).
- The Save Out Sea Act 2.0 (H.R. 3969/S. 1982 – SOS 2.0 Act) creates a Marine Debris Trust Fund available to NOAA to respond to certain marine debris events; it also creates a Marine Debris Foundation to support Marine Debris Program activities.
- Through the Canadian Plastic Innovation Challenge, the government is investing nearly Can$ 19 million to support Canadian innovators and small businesses to develop solutions for plastics challenges. The targeted sectors include reducing microfibers from textiles, finding sustainable alternatives to plastic packaging, research on sustainable fishing and aquaculture gear and improving the compostability of bioplastics.[66]

**Monitoring**

Monitoring and assessment of the national situation of microplastics provide a solid and scientific foundation for policy making and planning. Appropriate selection of criteria and indicators for data collection, surveying, monitoring and assessment are considered by States for better enforcement results. For example:

- NOAA launched the Marine Debris Monitoring and Assessment Project under its Marine Debris Program, introducing diverse monitoring methods and tools. The Marine Debris Monitoring and Assessment Project is a citizen science initiative that engages partner organisations and volunteers to participate in shoreline marine debris surveys. It provides debris trackers on mobile phones, toolbox and monitoring protocol and guidance for participants.
- The San Francisco Bay Microplastics Project aims to develop critical baseline data and inform solutions. To achieve this aim, it determined a baseline for future monitoring of microplastics in San Francisco Bay, therefore establishing the first comprehensive assessment of quantities and characteristics of microparticles and microplastics in the San Francisco Bay environment.
- Result Area 8 of the Canadian Strategy on Zero Plastic Waste visualised that effective research and monitoring systems could inform decision-making and measure performance. Suggested

[63] https://www.youtube.com/watch?v=Jd9U2QlesbY&feature=youtu.be

[64] https://echa.europa.eu/-/stakeholder-workshop-on-microplastic-particles

[65] https://issuu.com/plasticseuropeebook/docs/annualreport2018_plasticseurope_web

[66] https://www.unenvironment.org/news-and-stories/story/canada-leads-push-safeguard-worlds-oceans

research areas include the understanding of sources of microplastics pollution and its impacts on human health and the environment.

- According to the Australian government assessment on the industry-led, voluntary phase out of microbeads from rinse-off cosmetic, personal care and cleaning products, a compliance and monitoring protocol was finalised to include actions to ensure that the phase-out continued to be effective on an ongoing basis

**Reporting**

The reporting mechanism is an essential part of the management strategies for microplastics as it allows States to efficiently evaluate and assess the implementation situations and make changes accordingly. Examples of reporting practices include:

- As a participant in the OCS programme, the Port of Antwerp will publish the Operation Clean Sweep Port of Antwerp Activity Report on a two-year cycle, where both polymer producers and logistics companies are involved. This series of reports covers pellet loss situation, preventive measures taken as a response to its zero pellet loss commitment.
- OCS Blue provides for voluntary reporting by participating organisations.[67]
- Under the United States Marine Debris Act, Biennial Progress Reports are required. The report shall include the status of implementation, programs conducted and marine debris removal activities. The Interagency Marine Debris Coordinating Committee is in charge of the Biennial Progress Reports.
- Under the Canadian Zero Plastic Waste Initiative, a list of reporting items is provided which can include microplastics:[68]
  - kilograms of plastic litter diverted (captured or removed) from the environment
  - number of partners or organizations participating/ contributing to the project
  - number of participants or Canadians reached
  - number of best practices or tools developed leading to plastic pollution prevention/ reduction
  - number of tools developed/ adopted to assess plastic pollution
  - number of citizen science initiatives developed/ implemented
  - total number of sites at which data were collected.

**Evaluation and review**

Evaluation and review are included in national management strategies as a response to changing conditions in implementation. Evaluation and review are included in most American states' action plans on marine debris. Progress on reduction of microplastics pollution could be a component of these reviews. Examples of these practices include:

- Two progress check-ins annually are included in the 2020 Great Lake Marine Debris Action Plan, allowing participants to share information on measures and actions. The NOAA Marine Debris Program will also facilitate a mid-plan review and evaluation to better understand which goals, objectives, and actions are well supported and achievable, while some may require further assistance.
- The overall duration for both the 2019 Oregon Marine Debris Action Plan and the 2018 Washington Marine Debris Action Plan are six years, with a two-year operational cycle. At the end of an operational cycle, partners will participate in workshops to update these Action Plans.

[67] https://www.opcleansweep.org/pledge/ocs-blue/

[68] https://www.canada.ca/en/environment-climate-change/services/environmental-funding/programs/zero-plastic-waste-initiative.html

#### 5.4.3.3 Co-operation

**Domestic stakeholders included**

To have domestic stakeholders included in the process of decision making is critical for better implementation results. Many domestic processes include this element, examples include:

- In its process of adopting the Microbeads in Toiletries Regulations, the Canadian government published the proposed Microbeads in Toiletries Regulations in the Canada Gazette (Part I: Vol. 150, No. 45 – November 5, 2016) for a 75-day public comment period.
- Under the Netherland: Plastics Pact NL 2019-2025, stakeholder participation is intensely demonstrated in measures and actions to achieve the objectives in this Plastic Pact (article 1). Specifically, as provided in article 7, civil society organisations, regional and local authorities, trade associations, technology suppliers, knowledge institutions can participate in working groups to facilitate the successful implementation of the Plastics Pact.
- In the Australian voluntary phase out of microbeads from rinse-off cosmetic, personal care and cleaning products, the national industry association represented a variety of stakeholders including manufacturers and suppliers of hygiene, cosmetic and specialty products, their raw material suppliers and service providers.

**International capacity building**

International capacity building promotes exchange of information, statistics and experience regarding microplastic control, prevention and reduction. Technology transfer, experience and information sharing, as well as robust scientific research are possible through international cooperation between States. Examples of international cooperation on capacity building include:

- Under the Netherland: Plastics Pact NL 2019-2025, the Ministry of Infrastructure and Water Management encourages internationally operating Plastics-Using Companies to share at international level the knowledge and experience gained in circular design tracks, and the Ministry Infrastructure and Water Management of will support them in spreading knowledge.
- In 2015, the European Commission adopted an EU Action Plan for A Circular Economy. The supporting document, the European Strategy for Plastics in a Circular Economy, notes that international action will remain key to tackling the most significant sources of plastics litter in the oceans, i.e. insufficient waste management infrastructure in developing countries and emerging economies.

#### 5.4.3.4 Co-benefits

**Environmental**

As combating microplastics in the environment is the aim of national management strategies for microplastics, environment benefits would be the most relevant positive outcomes of their implementation.

**Social**

The most discussed social benefits in national management strategies for microplastics is public health. Examples of this positive outcomes include:

- The Hawai'i Marine Debris Action Plan (first published in 2010), was the first of its kind in the United States that aimed to reduce the ecological, health and safety impacts of marine debris in the Hawai'ian islands by 2020.
- As the independent scientific advice to the European Commission to inform policy making, the Group of Group of Chief Scientific Advisors provided scientific advice on the risks and its impact on the environment and human health from microplastic pollution, although in the absence of comprehensive and detailed evidence. The Group published a report on Environmental and Health Risks of Microplastic Pollution in 2019 (EU, 2019).

- Due to the concern about microbeads used in consumer products that enter the waterways with potential long-term risks to marine organisms and human health, Australia launched the industry-led, voluntary phase out of microbeads from rinse-off cosmetic, personal care and cleaning products.

**Economic**

The most discussed economic benefits in national management strategies for microplastics is the creation and maintenance of a circular economy. Examples of this positive outcomes include:

- As mentioned above, the Hawai'i Marine Debris Action Plan also aimed to reduce the economic impacts of marine debris in the Hawai'ian islands by 2020.
- As mentioned above, the European Strategy for Plastics in a Circular Economy aims to achieve a modern, low-carbon, resource and energy-efficient economy and will make a tangible contribution to reaching the 2030 Sustainable Development Goals and the Paris Agreement.

### 5.4.4 Performance Indicators

Loss of microplastics into the environment, including pre-production pellets, is not well quantified (Eunomia, 2018). Determining the effectiveness of controls and the setting of operational and reduction targets may be difficult, except where a target of elimination is targeted through bans. Baselines need to be set for release, capture and accumulation rates for the different sources. Preliminary data is available which could act as baseline estimates.

#### 5.4.4.1 Outputs

Reporting of the effectiveness of the national microplastics management strategy would need to reflect progress towards the operational and reduction targets. This could include:

Outputs:

- Environmental quality standards that include microplastic pollution thresholds
- Standards developed for design of products to minimise abrasion
- Standards for measuring abrasion rates
- Adoption of legislative and voluntary mechanisms
- Development of national microplastics monitoring programmes and the results thereof
- Reporting requirements across the life cycle of plastics for sources, pathways, capture and reduction trends.

##### 5.4.4.1.1 Outputs for life cycle phase 1: Source materials

The effectiveness of the microplastics national management strategy in the life cycle phase of **source materials** can be measured by the outputs and outcomes relevant to the adoption of industry best practices during production, transport and conversion of pre-production pellets. Table 19 highlights examples relevant to this prevention control.

*Table 19: Outcomes for the microplastics management strategy in the life cycle phase of source material*

| Output indicator | Example of outputs |
|---|---|

| | |
|---|---|
| Industry standards | • OCS action plan developed for the Port of Antwerp (PlasticsEurope, 2019) – volume of loss reported decreased from 15m$^3$ in 2017 to 7m$^3$ in 2018<br>• PlasticsEurope adopts new Operating Rules in June 2019, making OCS compulsory for all members from January 2020 (PlasticsEurope, 2019)<br>• OCS launched in Australia by NGO Tangaroa Blue[69] |
| Certification and labelling | • Pilot project proposed - an OCS certification system is to be jointly developed by PlasticsEurope & its member companies, including third party auditing programme as part of existing environmental or quality management systems (PlasticsEurope, 2019) |

#### 5.4.4.1.2 Outputs for monitoring and evaluation

The monitoring and evaluation phase is key to measuring the effectiveness of the microplastics national management strategy. This phase is characterised by research and guidelines on methodologies, with some data that could act as preliminary baselines. Table 24 highlights examples relevant to this prevention control.

*Table 20: Examples of outputs for microplastic management through monitoring and evaluation activities*

| Output indicator | Example of outputs |
|---|---|
| Research | • Recommendations for atmospheric microplastic sampling and measurement (Zhang et al., 2020).<br>• Review and assessment of data quality for microplastics in freshwaters and drinking water (Koelmans et al., 2019).<br>• Review of methodologies used to collect, quantify, and characterize microplastics in both wastewater and drinking water (Elkhatib and Oyanedel-Craver, 2020).<br>• Some problems and practicalities in design and interpretation of samples of microplastic waste (Underwood et al., 2017).<br>• Primary Microplastics in the Oceans: a global evaluation of sources (IUCN, 2017). |
| Guidelines and BEP | • Guidelines for the Monitoring and Assessment of Plastic Litter and Microplastics in the Ocean (GESAMP, 2019).<br>• Laboratory Methods for the Analysis of Microplastics in the Marine Environment (Masura et al., 2015).<br>• Methodology to monitor riverine inputs of micropalstics (Coalition Clean Baltic, 2017). |

#### 5.4.4.1.3 Outputs for life cycle phase 2: Product manufacture

The effectiveness of voluntary phase-outs and bans on the inclusion of microbeads in personal care products during the life cycle phase of **manufacture** can be measured by the outputs relevant to these two measures as well as the outcomes specific to these outputs. Table 20 highlights examples relevant to voluntary phase-outs and bans.[70]

*Table 21: Outputs for the microplastics management strategy in the life cycle phase of source materials*

| Outputs Indicator | Examples of outputs |
|---|---|
| Voluntary phase-out | • Cosmetics Europe - recommendation to members to discontinue use of plastic microbeads for cleansing & exfoliating purposes in wash-off cosmetic & personal care products |

[69] https://www.tangaroablue.org/pelletalertproject/operation-clean-sweep-australia/. See also http://www.opcleansweep.org.au/

[70] See https://www.beatthemicrobead.org/impact/global-impact/ for more examples of bans and phase-outs

| | |
|---|---|
| | • Australia Government - secure a voluntary agreement from industry to phase out microbeads in personal care, cosmetic & cleaning products within two years (no later than 1 July 2018)<br>• Supported by a monitoring and assurance protocol outlining the government's expectations of the relevant Industry Association<br>• Supported by the relevant Industry Association awareness campaign to promote industry engagement.[71] |
| Ban | • Microbead-Free Waters Act of 2015 (USA).[72]<br>• Prohibits the manufacturing, packaging, and distribution of rinse-off cosmetics containing plastic microbeads. |
| | • Canada – (2015) microbeads added to the List of Toxic Substances managed by the Government under the *Canadian Environmental Protection Act, 1999*<br>• Information was gathered to identify uses & sources of microbeads, including options for those not required to report but considered a stakeholder to complete a voluntary Declaration Stakeholder Interest form.[73] |
| | • ECHA's proposal to restrict the use of microplastics that are intentionally added to products on the EU/EEA market, in concentrations of more than 0.01 % weight by weight.[74] |
| Standards | • No standards found |
| Certification and labelling | • A new labelling scheme is in place in the EU for car and truck tyres will increase consumer awareness on abrasion. Labels must be clearly visible to consumers, including at point of sale and online, and include a QR code.[75] |

#### 5.4.4.1.4 Outputs for mitigation and recovery

The effectiveness of the microplastics management strategy in mitigation relates to the closing of knowledge gaps on leakage sources and pathways, quantification of such leakage and the capture of released microplastics. Table 23 highlights examples relevant to these activities.

*Table 22: Outcomes for the microplastics management strategy for mitigative and restorative activities*

| Outputs indicator | Example of outputs |
|---|---|
| Guidelines and BEP | • Guidance on concrete ways to reduce microplastic inputs from municipal stormwater and waste water discharges (Coalition Clean Baltic, 2017).<br>• Review of BAT and BEP in Urban Wastewater Treatment Systems focusing on the reductions and prevention of stormwater related litter, including micro-plastics, entering the Marine Environment (OSPAR Commission, 2019a). |

### 5.4.4.2 Outcomes

#### 5.4.4.2.1 Outcomes for life cycle phase 1: Source materials

The effectiveness of the microplastics national management strategy in the life cycle phase of **source materials** can be measured by the outputs and outcomes relevant to the adoption

[71] https://accord.asn.au/sustainability/beadrecede/
[72] https://www.congress.gov/bill/114th-congress/house-bill/1321/text
[73] http://canadagazette.gc.ca/rp-pr/p1/2015/2015-08-01/html/notice-avis-eng.html
[74] https://echa.europa.eu/it/-/rac-backs-restricting-intentional-uses-of-microplastics
[75] https://www.europarl.europa.eu/news/en/press-room/20200512IPR78920/new-tyre-labels-to-include-information-on-energy-consumption-and-grip

of industry best practices during production, transport and conversion of pre-production pellets. Table 19 highlights examples relevant to this prevention control.

*Table 23: Outcomes for the microplastics management strategy in the life cycle phase of source material*

| Outcome indicator | Example of outcomes |
|---|---|
| Pollution legislation | • Austria - legislation classifies plastic as a filterable substance. A discharge limit of 30 mg/L as set by the legislation potentially permits emissions of 94.5 tons/year (Lechner and Ramler, 2015).<br>• NPDES regulations for storm-water discharge, published by the US EPA in 1990, define plastic pellet discharges as significant and therefore should be subject to regulations requiring industries to obtain NPDES permits under the Clean Water Act for storm sewers that lead to public waterways (US EPA, 1992).[76]<br>• California State Water Board adopted an official definition of microplastics in drinking water, providing a basis for further work at the Water Board under the California Safe Drinking Water Act (Act). In addition the Water Board is required to establish a standard methodology for four years of testing of drinking water and reporting of results, including public disclosure of the findings.[77] |

#### 5.4.4.2.2 Outcomes for life cycle phase 2: Product manufacture

The effectiveness of voluntary phase-outs and bans on the inclusion of microbeads in personal care products during the life cycle phase of **manufacture** can be measured by the outputs relevant to these two measures as well as the outcomes specific to these outputs. Table 20 highlights examples relevant to voluntary phase-outs and bans.[78]

*Table 24: Outcomes for the microplastics management strategy in the life cycle phase of source materials*

| Indicator | Examples of outputs | Examples of outcomes |
|---|---|---|
| Voluntary phase-out | Cosmetics Europe | • Decrease of 97.6% (4250 tons) in the use of plastic microbeads for cleansing and exfoliating purposes in wash-off cosmetic and personal care products (2012-2017).[79] |
| | Australia Government voluntary agreement | • 94% of all products surveyed did not contain microbeads or other non-soluble plastic polymers<br>• Some categories of rinse-off products, such as body washes, did not contain any microbeads or other non-soluble polymers<br>• The majority of the products still containing microbeads or other non-soluble plastic polymers were not rinse-off products, would not reach the marine environment under normal use and therefore fall outside the scope of the phase-out.<br>• Not all companies are members of the relevant Industry Association, but efforts are being made to engage these companies. |

[76] See https://www.epa.gov/npdes/about-npdes

[77] https://www.waterboards.ca.gov/press_room/press_releases/2020/pr06162020_microplastics.pdf

[78] See https://www.beatthemicrobead.org/impact/global-impact/ for more examples of bans and phase-outs

[79] https://cosmeticseurope.eu/news-events/over-97-plastic-microbeads-already-phased-out-cosmetics-cosmetics-europe-announces/

| | | |
|---|---|---|
| | | • It was determined that legislation is not needed at this stage.[80] |
| Ban | Microbead-Free Waters Act of 2015 (USA). | • No results found |
| | Canada – microbeads added to the List of Toxic Substances | • No results found |
| | ECHA's proposal to restrict the use of microplastics | • The proposed restriction are expected to prevent over 90 % of current releases, equivalent to 500,000 tonnes of microplastic over a 20-year period.[81] |
| Standards | No standards found | • n/a |
| Certification and labelling | EU labelling scheme for car and truck tyres | • A certification scheme is estimated to reduce a cumulative 600,000 tonnes to surface waters in the EU for the years 2017 to 2035 and is estimated to be the most cost-effective (Eunomia, 2018). |

#### 5.4.4.2.3 Outcomes for life cycle phase 3: Use

The effectiveness of the microplastics management strategy in preventing leakage during the life cycle phase of use relies on the promotion of alternatives to products that release microplastics, Measures of effectiveness include the development of awareness campaigns to inform consumers of the choices available. Table 21 highlights examples relevant to awareness-raising actions.

*Table 25: Outcomes for the microplastics management strategy in the cycle phase of source materials*

| Output indicator | Example of outputs |
|---|---|
| Awareness campaigns | • Beat the Microbead – international campaign to remove microplastics from cosmetics.[82]<br>• Hubbub's campaign #WhatsInMyWash provides options to consumers to reduce the impacts of washing their clothes and places a call to industry to assist in solving the problem.[83]<br>• Ocean Clean Wash is a campaign initiated by the Plastic Soup Foundation in 2016.[84] |

#### 5.4.4.2.4 Outcomes for life cycle phase 4: End-of-life

The prevention controls at the end-of-life phase of a microplastics management strategy are based on capture of microfibres within washing machines. Table 22 highlights some research outputs for capture devices in the home environment.

*Table 26: Outcomes for the microplastics management strategy in the cycle phase of end-of-life*

| Outcome indicator | Example of outcomes |
|---|---|

[80] https://www.environment.gov.au/protection/waste-resource-recovery/publications/assessment-voluntary-phase-out-microbeads
[81] https://echa.europa.eu/it/-/rac-backs-restricting-intentional-uses-of-microplastics
[82] https://www.beatthemicrobead.org/
[83] https://www.whatsinmywash.org.uk/
[84] https://www.oceancleanwash.org/campaign/

| | |
|---|---|
| Research – washing machine capture | • Filters reduced polyester fibres in effluent by > 65% (micrometre-sized pores) 74% (millimetre-sized pores) (Browne et al., 2020).<br>• The Lint LUV-R has been shown to capture an average of 87% of by count in washing machines, while the Cora Ball captures 26% by count (McIlwraith et al., 2019). |

#### 5.4.4.2.5 Outcomes for mitigation and recovery

The effectiveness of the microplastics management strategy in mitigation relates to the closing of knowledge gaps on leakage sources and pathways, quantification of such leakage and the capture of released microplastics. Table 23 highlights examples relevant to these activities.

*Table 27: Outcomes for the microplastics management strategy for mitigative and restorative activities*

| Outcomes indicator | Example of outputs |
|---|---|
| Research | • An overall efficiency of 79% in terms of particle number and 89% in terms of particle estimated for biofiltration at wastewater treatment facilities. (Fan Liu et al., 2020).<br>• The Lint LUV-R has been shown to capture an average of 87% of by count in washing machines, while the Cora Ball captures 26% by count (McIlwraith et al., 2019). |

#### 5.4.4.2.6 Outcomes for monitoring and evaluation

The monitoring and evaluation phase is key to measuring the effectiveness of the microplastics national management strategy. This phase is characterised by research and guidelines on methodologies, with some data that could act as preliminary baselines. Table 24 highlights examples relevant to this prevention control.

*Table 28: Examples of outputs for microplastic management through monitoring and evaluation activities*

| Outcome indicator | Example of outcomes |
|---|---|
| Determining baselines | • A per-capita discharge by mass of tyre abrasion ranges from 0.2 to 5.5 kg (Baensch-Baltruschat et al., 2020).<br>• In the US, daily discharge of microplastics from wastewater treatment facilities ranged from ~50,000 to nearly 15 million particles, resulting in a release of over 4 million microparticles per facility per day (Mason et al., 2016).<br>• In the EU, releases of intentionally added microplastics are estimated at 42,000 tonnes/year. Releases from infill material used in artificial turf pitches are estimated at 16,000 tonnes/year.[85]<br>• A number of baselines have been estimated for releases of pre-production pellets, automotive tyres, washing of synthetic textiles, artificial turf, road markings, building paint and from wastewater treatment facilities, together with estimated annual costs per tonne of prevention at source (Eunomia, 2018).<br>• In Hong Kong, treated sewage and stormwater effluents contained up to 10,816 pieces per $m^3$ of microplastics with an average daily discharge rate of 3.5 mg per capita (Mak et al., 2020). |

[85] https://echa.europa.eu/it/-/rac-backs-restricting-intentional-uses-of-microplastics

## 5.5 Summary of Indicators

The outcomes of operational controls as reflected in the Bowtie analysis across the four primary life cycle phases of marine litter and microplastics have been reflected in the performance indicators of the management controls. These were discussed in the analysis of indicators.

Table 29 summarises the inclusion of these indicators within the microplastics management strategy and provides an analysis of each. Where the indicators are not well represented, this is also reflected in the table.

*Table 29: Summary of indicators for the microplastics management strategy*

| Indicator Type | Indicator | Description | Evaluation |
|---|---|---|---|
| INPUT | Scope | International, regional or national | National |
| | Maturity | Operational years - high, medium, low | Medium |
| | Scale | Level of adoption | Low |
| PROCESS | Governance | Management targets<br>Operational targets | Low<br>Low (applies mostly to microbeads and pellets) |
| | Management | Local capacity building<br>Ongoing funding secured<br>Monitoring in place<br>Reporting in place<br><br>Review process defined | Yes<br>Yes - limited<br>Yes - limited at national level<br>Yes – inferred in general reporting requirements<br>Yes - inferred in general reporting requirements |
| | Co-operation | Domestic stakeholder inclusion<br>International capacity building | Yes – limited to microbead bans<br>Yes - limited |
| | Co-benefits | Environmental<br>Social<br>Economic | Yes<br>Yes – limited<br>Yes – limited |
| PERFORMANCE | Outputs | Qualitative and quantitative | Yes – not clearly reported |
| | Outcomes | | Yes – mostly for leakage rates. |

## 5.6 Conclusion

Pollution by microplastics is increasingly recognised at the national level. Research is ongoing in building knowledge on the sources and pathways. Control measures predominantly focus on microbeads and are mostly limited to those intentionally added to cosmetics. Controls to eliminate leakage of pre-production pellets are primarily voluntary and managed by industry. More recently, information on automotive tyre abrasion rates is to be included in labelling schemes.

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# Annex I: Barriers identified for the prevention of marine litter and microplastics

| Scope | Barriers suggested |
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| Global and regional | **Lack of:** (1) financial resources to combat marine litter both from land and sea; (2) a consolidated international legal framework, leading to gaps in regulations, especially upstream phase; (3) a centralised authority for the management of plastics through its lifecycle, i.e. from raw materials to end-of-use phase; (4) global standards for reporting and monitoring at national levels; (5) full consideration of the problems in existing instruments and organisations, leading to a lack of coordination among existing initiatives; (6) a strong capacity building scheme; (7) standardised industry standards for environmental controls and quality specifications.<br>**Ineffective**: (1) compliance or enforcement mechanisms in MEAs; (2) collaboration and discussions among member States, organisations and instruments; (3) geographically, as inland waters and watersheds are not always covered, ABNJ are only marginally included, therefore, the main polluting areas are not covered by legally binding conventions. |
| General across all life cycle phases | There is **no strategy framework** for marine pollution, and **legislative gaps** in targeting land- and sea-based litter and microplastic can be found in many aspects and phases. A **lack of resources** at the national level leads to inadequate policy and legislative processes. National legislation on production, storage, transport, recycling and/or disposal of plastic waste is often insufficient or unclear, or is focused purely on the end of life challenges of plastic waste. In practice, **a lack of capacity, knowledge and resources** results in inefficient enforcement of legal instruments. Industry regulation, waste and wastewater management, reduction of non-recoverable microplastics, and human rights implications are not adopted to provide clear binding standards. Systematic scientific research and monitoring, coordination, transparency and reporting, which are essential elements in preventing and reducing marine litter are not sufficient. |
| Life cycle Phase 1: Source materials | Solutions focus mainly on adaption measures instead of mitigation.<br>The overall source-to-sea point of view, namely the upstream design phase of plastic products to the final treatment of plastic needs to be considered. |
| Life cycle Phase 2: Manufacture | Requirement for shipping industry: no mandatory requirement for shippers to declare cargoes that are "**harmful to the environment**"; no assessment of list of solid bulk cargoes that are "harmful to the environment".<br>Financial support: emphasis on funding end-of-life clean up initiatives, while no contribution to **an overall reduction** in marine litter, or **behavioural change at source**; insufficient secondary markets for **recyclates**.<br>Requirement for design: no science-based **product design or production** to avoid unintentional loss of plastic<br>Regulations and policies: potential legislative gaps in production and use of land-based materials causing marine litter; as current consumption and production patterns leading to marine pollution, life cycle approaches and Green Economy principles have not been addressed; insufficient **implementation of the polluter-pays** principle tailored to the issue at stake; |
| Life cycle Phase 3: Use | Technology: no appropriate technologies in replacing plastics and microplastic with environmentally-friendly materials.<br>Policies: current consumption and production patterns are a contributor to marine pollution, life cycle approaches and Green Economy principles have not been addressed; insufficient **implementation of the polluter-pays** principle tailored to the issue at stake. |
| Life cycle Phase 4: End-of-life | Waste management (including chemical management): potential **legislative gaps** in industrial litter and wastewater into coastal areas, litter removal and prevention; insufficient investment in waste management, which leads **lack of infrastructure** dealing |

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| | with current production and consumption; investment misplaced in unsustainable short-term projects including incineration; insufficient implementation of polluter-pays principle.<br>Information management: **lack of information or reporting mechanism** for land-based pollution into coastal environment; no information regarding potentially toxic additives, residues or non-intentionally added substances in plastic products, leading to difficulties in recycling. |
| Monitoring & evaluation | There is a lack of understanding of the physiological and ecological impacts of microplastics. Information gaps exist in standard and consistent method of data collection on trends and abundances of marine litter globally. |
| Mitigation & Restoration | Not all vessels are required to carry GPS to facilitate location logging of lost gear for later retrieval. Gear loss reporting is nor mandatory; sharing of information regarding gear loss is insufficient and does not assist in reducing gear conflict |