



**Asia-Pacific  
Economic Cooperation**

**Advancing** Free Trade  
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# **Compendium of Policies and Preventive Measures to Reduce Land- based Marine Debris in APEC Economies**

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**APEC Policy Support Unit**  
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Prepared by:

Ramboll Environ Singapore Pte Ltd

Akhmad Bayhaqi and Satvinderjit Kaur Singh  
Asia-Pacific Economic Cooperation Policy Support Unit  
Asia-Pacific Economic Cooperation Secretariat  
35 Heng Mui Keng Terrace  
Singapore 119616  
Tel: (65) 6891-9600 Fax: (65) 6891-9690  
Email: psugroup@apec.org Website: www.apec.org

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The views expressed in this paper are those of the authors and do not necessarily represent those of APEC Member Economies

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## EXECUTIVE SUMMARY

Marine debris (or marine litter) can be defined simply as ‘litter that ends up in oceans, seas, and other large bodies of water’. It is estimated that 80 percent of all marine debris is made up of plastics, a non-biodegradable, synthetic organic polymer. Additionally, about 80 percent of plastic waste in the oceans comes from land-based sources. Marine debris has been recognised as a growing concern globally with impacts on economies, the environment (including marine organisms and their ecosystems), and potentially, human health.

To support the APEC Chile 2019 priorities, Chile proposed to develop a compendium of preventive measures for marine debris control in APEC economies. Preventive measures in this context are those that aim to reduce the amount of marine debris and contributing materials. To gather information for the compendium, direct survey and secondary research are used. Areas covered include waste management measures, land-based and sea-based marine debris preventive measures, marine debris monitoring, and current measures for plastic waste.

The main findings from the survey responses and secondary research are as follows:

### **Summary of Measures, Policies and Initiatives Implemented by APEC Economies**

- Most economies have established general management of domestic and industrial waste. They have regulations on proper waste management, anti-littering, and prevention of dumping of waste on land (especially beaches) and/or at sea from any ship or vessel.
- With legislation in place, several economies have implemented enforcement regimes that are essential to preventing marine debris pollution. Enforcement efforts target sources of pollution, including industries such as fishery and aquaculture, and even landfill sites near rivers.
- Many economies have implemented economy-wide policies to prevent marine debris pollution through the 3Rs (reduce, reuse and recycle) and reduction of plastic usage.
- Many economies have developed waste management services or infrastructure at strategic locations (such as harbours, ports or villages) and they provide transportation of waste from remote islands to the mainland for disposal and treatment.
- Many economies encourage collaboration and partnerships between the public and private sectors to promote clean-ups, education campaigns, and innovation in alternatives to plastic.
- Most economies provide funding for academia to conduct research on marine debris, including monitoring and clean-up. In some cases, subsidies are provided to local governments to set up waste management infrastructure (recycling stations).
- Research conducted by most economies focus on the impact of marine debris, typically microplastics, its distribution, its impact on biodiversity and health, as well as monitoring methods.
- Many economies conduct beach clean-up activities as a remedial measure, and some economies clean up marine debris floating on the sea or even those on the seabed

(underwater). These activities are targeted at polluted areas and require collaboration among local governments, voluntary groups and public institutions.

### Gaps in Marine Debris Prevention

- **Regulatory framework:** There is a need for stricter enforcement, especially (directly) in areas where the source of the marine debris (e.g., fisheries or illegal dumping) is occurring or can be identified. More has to be done to develop laws specific to the management of plastic waste and recycling.
- **Institutional framework:** There is no clear institutional framework for creating a detailed economy-wide action plan to implement new policies, infrastructure (municipal or recycling facilities), education, research, funding and communication across various relevant stakeholders.
- **Collaboration:** New policies and measures on marine debris may suffer from a lack of engagement by and constructive feedback from stakeholders during the design and implementation stages.
- **Innovation:** Despite the gradual restriction and ban of plastics in many APEC economies, there is a lack of innovation on alternative materials.
- **Awareness:** There is an absence of targeted awareness-raising across known marine debris sources, such as industry sectors (e.g., fisheries, aquaculture or tourism) or community groups (e.g., in rural or coastal areas).
- **Remedial measures:** There is still a lack of coordinated efforts and planning for marine debris clean-up activities, including clean-up protocols, guidance on methodologies and centralisation of marine debris data.
- **Monitoring:** Many economies employ manual counting during beach clean-ups, which suggests the need for more effective and efficient monitoring systems and wider adoption of current technologies.

Overall, APEC economies have implemented a wide range of measures, including both regulatory and non-regulatory instruments, to manage marine debris pollution. Through the compendium, APEC economies would be able to gain a better understanding of current best practices and identify areas for future collaboration.

# 1. INTRODUCTION

Marine debris (or marine litter) is defined as ‘any persistent solid material that is manufactured or processed and directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment’.<sup>1</sup> A simpler definition by National Geographic says: ‘Marine debris is litter that ends up in oceans, seas, and other large bodies of water’. It is estimated that 80 percent of all marine debris is made up of plastics, a non-biodegradable, synthetic organic polymer.<sup>2</sup> Experts estimate that about 80 percent of plastic waste in the oceans comes from land-based sources. Marine debris has been recognised as a growing concern globally with impacts on economies, the environment (including marine organisms and their ecosystems), and potentially, human health. Urgent measures are needed to control the increasing flow of plastic waste into the ocean.

Several studies conducted by APEC show that marine debris results in substantial environmental, economic and social costs to APEC economies. The Oceans and Fisheries Working Group (OFWG) previously endorsed the need for a systematic capacity-building programme to address marine debris and approved the Capacity Building for Marine Debris Prevention and Management in the APEC Region Project in 2016.<sup>3</sup> To support the APEC Chile 2019 priorities, Chile proposed developing a compendium of preventive measures for marine debris control in APEC economies. Preventive measures in this context are those that aim to reduce the amount of marine debris and contributing materials. The preventive measures and policies on marine debris of APEC economies are gathered through direct survey and secondary research in areas such as waste management measures, land-based and sea-based marine debris preventive measures, marine debris monitoring, and current measures for plastic waste.

This report summarises the findings of the survey and research, and creates a compendium of preventive measures and policies that APEC economies are taking to reduce land-based marine debris. Through the compendium, APEC economies can gain a better understanding of current best practices and will be able to identify areas for future collaboration.

## 2. OVERVIEW

### 2.1 BACKGROUND TO THE STUDY

Since 1990, the year APEC Ministers first proposed it as a new area of work, marine debris has been a discussion topic in APEC.<sup>4</sup> Since then, APEC has held four Oceans-related Ministerial Meetings, and formed the Ocean and Fisheries Working Group (OFWG) and the Virtual

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<sup>1</sup> B.D. Hardesty et al., ‘Understanding Debris Sources and Transport from the Coastal Margin to the Ocean’ (EP165651, CSIRO, 2016).

<sup>2</sup> ‘UN Declares War on Ocean Plastic’, United Nations Environment Programme, 23 February 2017, <https://www.unenvironment.org/news-and-stories/press-release/un-declares-war-ocean-plastic>.

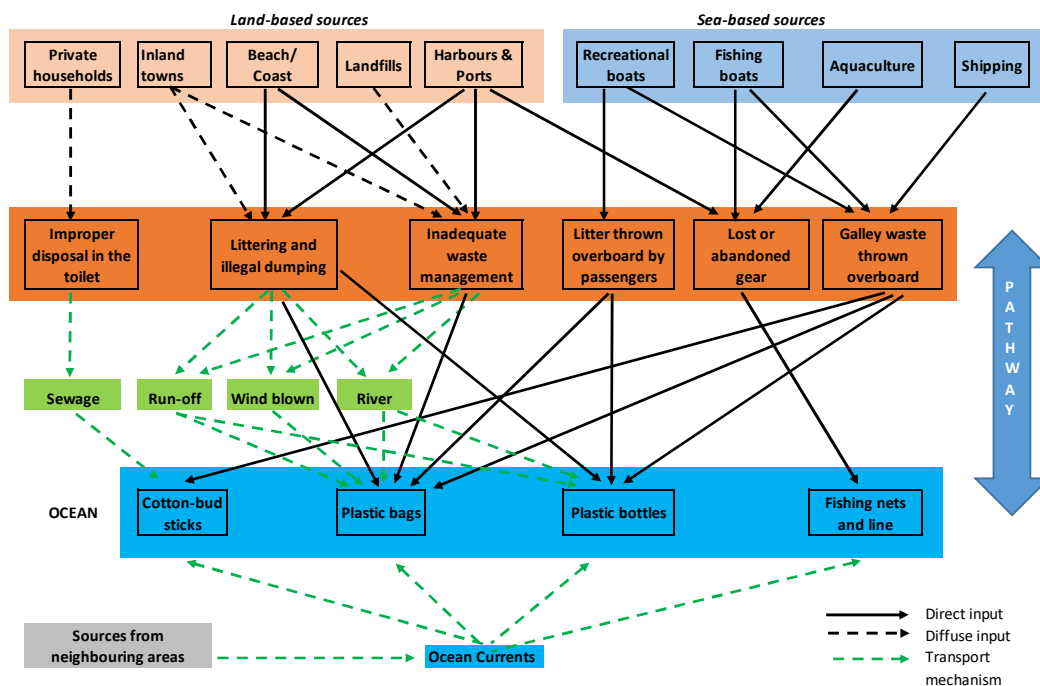
<sup>3</sup> ‘Ocean and Fisheries’, Asia-Pacific Economic Cooperation, updated September 2019, <https://www.apec.org/Groups/SOM-Steering-Committee-on-Economic-and-Technical-Cooperation/Working-Groups/Ocean-and-Fisheries>.

<sup>4</sup> ‘1990 APEC Ministerial Meeting, Singapore, 29 July 1990’, Asia-Pacific Economic Cooperation, 29 July 1990, [https://www.apec.org/Meeting-Papers/Annual-Ministerial-Meetings/1990/1990\\_amm](https://www.apec.org/Meeting-Papers/Annual-Ministerial-Meetings/1990/1990_amm)

Working Group on Marine Debris. At the 2014 Ocean-related Ministerial Meeting, Ministers in their Xiamen Declaration agreed to encourage cooperation on the reduction and mitigation of marine pollution (including from land-based sources and oil spills) and on the continued expansion of efforts to reduce marine debris. In 2016, APEC Leaders encouraged work to address the lack of effective waste management to better manage the marine debris issue.

As a step toward improving waste management, an understanding of APEC economies' current preventive measures and policies to reduce the entry of plastic waste into the sea is required. Veiga et al. divide the origin of marine debris into: (1) sea-based origin: litter that is being directly released into the sea as a result of maritime activities such as shipping, fishing, offshore installations, and dumping of refuse at sea; and (2) land-based origin: litter that originates from the coast such as beach tourism, but also includes sources from more distant areas such as towns or industrial sites that make their way into the sea through certain transport or pathway mechanisms; more specifically rivers are considered the transport mechanism whereas effluents are regarded as the pathway of entry.<sup>5</sup> Figure 2.1 provides an example of the 'supply-chain' of waste from land-based and sea-based sources into the ocean.

**Figure 2.1. Multiple sea- and land-based sources of four common items of marine litter and their potential pathways of entrance into the marine environment**



Source: Adapted from J.M. Veiga et al., 'Identifying Sources of Marine Litter. MSFD GES TG Marine Litter Thematic Report' (JRC Technical Report, EUR 28309, Luxembourg: Publications Office of the European Union, 2016), 11, doi:10.2788/018068.

<sup>5</sup> J.M. Veiga et al., 'Identifying Sources of Marine Litter. MSFD GES TG Marine Litter Thematic Report' (JRC Technical Report, EUR 28309, Luxembourg: Publications Office of the European Union, 2016), 11, doi:10.2788/018068.



A marine debris survey was conducted to gather APEC economies' responses on the preventive measures they have in place to tackle marine debris. In this way, economies will be able to share their current best practices and find possible ways to collaborate.

The key objective of the survey is to develop a compendium of preventive measures for marine debris management in APEC economies. The scope of this study includes:

- **Improving waste management measures** – by understanding how economies regulate waste management and development laws, and binding management instruments on waste management.
- **Improving the terrestrial environment** – through best practice landfill systems, and incentive schemes for efficient and sustainable waste storage solutions.
- **Prevent the entrance of marine debris** – by understanding how best to apply preventive measures such as regulation of submarine emissaries, emissions of naval artifacts, and industrial waste.
- **Enhancing the monitoring of marine litter** – through a shared understanding of the best monitoring measures and how economies can work together to monitor on a regional basis.

Current measures focusing on plastic waste are also included:

- **Plastic waste prevention policies** – including prevention and control measures such as reducing the unnecessary use of single-use plastic, the content of harmful substances, and the adverse impacts of waste on the environment.
- **Effective management of plastic waste** – according to the principle of hierarchy which may include preparation for reuse, recycle and other forms of recovery (including energy recovery and disposal).

## 2.2 MARINE DEBRIS POLLUTION

The sources of marine debris can generally be classified into land-based and sea-based. Examples are listed below.<sup>6</sup>

- **Sources of land-based marine debris**
  - landfills
  - rivers and floodwaters
  - industrial outfalls
  - discharge from stormwater drains
  - untreated municipal sewerage
  - littering of beaches or coastal areas.
- **Sources of sea-based marine debris**
  - fishing and aquaculture
  - shipping (e.g., transport, tourism)
  - offshore mining and extraction
  - illegal or accidental dumping at sea.

Marine debris comprises of many materials including glass, wood, metals and rubber, but plastics make up the majority (80 percent). Plastic is a non-biodegradable polymer that has a

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<sup>6</sup> 'Our Oceans, Seas and Coasts, Descriptor 10: Marine Litter', European Commission, updated 4 October 2019, [https://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/index\\_en.htm?](https://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/index_en.htm?)

wide variety of applications and due to its low cost, the demand for its production continues to rise. It is estimated that 265 million tonnes of plastics were produced in 2010, and their demand is predicted to reach up to 300 million tonnes by 2020.

Due to the lack of proper management, these plastic wastes are expected to end up in the ocean. Plastic waste has accumulated at such a high concentration in the Pacific Ocean (over decades) that a floating mass of waste called the Great Pacific Garbage Patch, covering an area of 1.6 million km<sup>2</sup> has formed.<sup>7</sup> It is estimated that more than 150 million tonnes of plastics have accumulated in the world's oceans, while an additional 4.6 to 12.7 million tonnes are added every year.<sup>8</sup>

It is broadly estimated that approximately 80 percent of marine debris is land-based, with some specific regional variations (shipping and fishing are dominant sources of litter in the Northeast Atlantic). Marine debris has the potential to cause serious economic damage to coastal communities, tourism, shipping and fishing. It was estimated to cost APEC economies approximately USD 1.265 billion in 2008.<sup>9</sup> More recently, in other regions like the European Union (EU), marine debris was estimated to cost member economies about EUR 630 million per year in the form of coastal and beach clean-ups; while the cost to the fishing industry reached EUR 60 million, around 1 percent of the total revenue of the EU fishing fleet in 2010.<sup>10</sup>

Besides economic impacts, marine debris has an immense effect on the environment; for example, it threatens marine life through accidental ingestion and potential entanglement. Even though plastics do not biodegrade, they break down into smaller pieces (size of less than 5mm) called microplastics under the influence of ultraviolet (UV) radiation. These microplastics contain toxic substances that can travel up the food chain and will be ultimately consumed by humans. In some cases, marine debris also pollutes beaches and coastlines, which creates aesthetic problems that threaten the tourism industry.

## 2.3 STUDY METHODOLOGY

The methodology consists of both primary and secondary research. For the former, a survey questionnaire was developed and administered to all APEC economies; for the latter, a review of secondary data was undertaken to complement and complete the gaps from the survey. They are further described below.

### a. Develop questionnaire

A survey questionnaire was developed to address key issues, including:

- Understanding how APEC economies regulate waste management, and develop laws and binding management instruments on waste management
  - Current waste management regulatory framework
  - Specific marine debris regulatory instruments (if any)

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7 L. Lebreton et al., 'Evidence that the Great Pacific Garbage Patch is Rapidly Accumulating Plastic', *Scientific Reports* vol. 8, no. 1 (2018): 4666, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5864935/>

8 J.R. Jambeck et al., 'Plastic Waste Inputs from Land into the Ocean', *Science* 347, no. 6223 (2015): 768–71, doi:10.1126/science.1260352.

9 A. McIlgorm, H.F. Campbell and M.J. Rule, 'Understanding the Economic Benefits and Costs of Controlling Marine Debris in the APEC Region (MRC 02/2007)' (APEC Marine Resource Conservation Working Group, 2008).

<sup>10</sup> European Commission, 'Descriptor 10: Marine Litter'.

- Proposed/future regulatory changes to address marine debris
- Understanding how the terrestrial environment can be improved to prevent land-based marine debris (preventive measures)
  - Beach litter prevention
  - Best practice landfill systems
  - Incentive schemes for efficient and sustainable waste storage solutions
- Understanding how the marine environment can be improved once land-based marine debris has reached the sea (remedial measures)
  - Mitigation measures at sea
  - Biological/marine-related remedial measures
- Understanding management instruments to prevent and mitigate marine debris at source
  - Policy and regulation
  - Industry-led (e.g., incentive-based or market-based instruments)
  - Government–industry collaboration
  - Facilitation of investment in infrastructure improvements (e.g., investment in sewerage systems, outfalls, etc.)
  - Public participation (e.g., clean-up, education)
- Implications of land-based marine debris for APEC economies
  - Biological implications of marine debris, including understanding of key concerns for APEC economies (corals, microplastics, etc.)
  - Socioeconomic implications of marine anthropogenic litter, including identification of key affected sectors for APEC economies (fisheries, tourism, shipping, etc.)
- Enhancing the monitoring of marine debris
  - Current and best monitoring measures for various sources of marine debris:
    - landfills
    - rivers and floodwaters
    - industrial outfalls
    - discharge from stormwater drains
    - untreated municipal sewerage
    - littering of beaches or coastal areas
  - Recent actions taken by APEC economies
- Understanding of the current issues with plastic waste
  - Policy and regulation
  - Adopt the principles of waste hierarchy in plastic waste management
- Recommendations for good practice to be implemented, per sector group, per APEC economy, and collaboratively across APEC economies
  - Suggestions of how economies can work together to manage and monitor on a regional basis

## **b. Complete gaps using secondary data**

A review of secondary data was conducted to bridge any gaps from the survey responses, contextualise the survey results and provide an overview of the topic.

Secondary data was drawn from the following sources:

- APEC economies’ legislative websites
- Reference documents:
  - Capacity Building for Marine Debris Prevention and Management in the APEC Region, Workshop Report, Korea 2017

- Marine Litter in the Wider Caribbean: A Regional Overview and Action Plan (RAPMaLi), United Nations Environment Programme 2014
- Marine Anthropogenic Litter, Open Access 20153
- The European Union’s Marine Strategy Framework Directive (MSFD)
- APEC OFWG publications
- Other relevant secondary sources

While the research focused on APEC economies, reference was made to non-APEC economies, including Norway and the European Union, to highlight good practices and emerging preventative measures and policies in the field.

### **c. Review of survey responses**

Completed questionnaires were received from the following APEC economies:

1. Canada
2. Chile
3. China
4. Japan
5. Korea
6. New Zealand
7. Peru
8. Singapore
9. Chinese Taipei
10. United States

The completed questionnaires were analysed, and the main findings summarised in this report. A more detailed summary is provided as an annex to this report.

### 3. MEASURES TO TACKLE MARINE DEBRIS IN APEC ECONOMIES

This section summarises the responses of the marine debris survey from 10 APEC economies and is completed with additional secondary data where available. For the remaining APEC economies, an overview of their key measures is highlighted using available secondary data and literature.

It should be noted that some of the findings are based on secondary data from various sources stated in the methodology and efforts have been made to verify data validity.

#### 3.1 AUSTRALIA

Marine debris is listed as a key process threatening marine life under Australia's Environment Protection and Biodiversity Conservation Act,<sup>11</sup> and a Threat Abatement Plan<sup>12</sup> has been established to understand the impact of microplastics pollution and discover new waste management technologies. The Threat Abatement Plan provides guidance on actions toward marine debris prevention based on the following objectives:<sup>13</sup>

- Contribute to long-term prevention of the incidence of marine debris.
- Understand the scale of impact of marine plastic and microplastic on key species, ecological communities and locations.
- Remove existing marine debris.
- Monitor quantities, origins, types and hazardous chemical contaminants of marine debris, and assess the effectiveness of management arrangements for reducing marine debris.
- Increase public understanding of the causes and impacts of harmful marine debris, including microplastic and hazardous chemical contaminants, to bring about behavioural changes.

The Threat Abatement Plan complements Australia's National Waste Policy 2018<sup>14</sup> to mitigate marine debris by tackling marine debris at the source, improving waste reduction and recycling, and encouraging industry to establish Extended Producer Responsibility for their products.<sup>15</sup>

Australia has also committed to a target of 100 percent recyclable, compostable or reusable packaging by 2025 to reduce waste.<sup>16</sup> The Australian Packaging Covenant is the main economy-wide instrument governing the reduction of environmental impacts of consumer packaging. The Covenant has developed a strategic plan to work on developing sustainable packaging and design, diverting packaging from landfill through consumer education and

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<sup>11</sup> <https://www.legislation.gov.au/Details/c2016c00777>

<sup>12</sup> <http://environment.gov.au/marine/publications/threat-abatement-plan-impacts-marine-debris-vertebrate-marine-life>

<sup>13</sup> <https://www.environment.gov.au/system/files/resources/e3318495-2389-4ffc-b734-164cdd67fe19/files/tap-marine-debris-2018.pdf>

<sup>14</sup> <https://www.environment.gov.au/system/files/resources/d523f4e9-d958-466b-9fd1-3b7d6283f006/files/national-waste-policy-2018.pdf>

<sup>15</sup> <http://www.environment.gov.au/protection/waste-resource-recovery/national-waste-reports/national-waste-report-2013/product-stewardship>

<sup>16</sup> <https://www.packagingcovenant.org.au/who-we-are/australias-2025-national-packaging-targets>

packaging disposal labelling, and improving packaging sustainability performance through research and sharing of knowledge across industries.

To reduce plastic waste at its source, Australia has established other measures such as voluntary phasing out of microbeads from personal care and cosmetic products, encouraging the ban of single-use plastic bags in all its regions, and implementing container deposit schemes to keep plastics out of the environment and landfills.<sup>17</sup>

Regionally, Australia has participated in marine debris prevention efforts, including the Pacific Ocean Litter Project (POLP)<sup>18</sup> and APEC's initiative on this issue.<sup>19</sup> The POLP aims to reduce sources of single-use plastics and focus on reduce and refuse (rather than recycle) approaches to waste management within the Pacific Island economies.

The key remedial actions for Australia are the routine clean-up of beach and waterways at numerous locations, even in remote and polluted areas. Collected marine debris is recorded in the Australian Marine Debris Database<sup>20</sup> that contains information on quantities, types of marine debris, and frequency of clean-up and changes over time in an area. This data will aid in identifying solutions that are customised to a specific area. Funding is also provided for larger scale clean-ups such as that for the Great Barrier Reef.

### **3.2 BRUNEI DARUSSALAM**

The following are the key features of waste management in Brunei Darussalam:<sup>21</sup>

- In general, landfill is the most common waste disposal method. The current generation of landfill sites are generally not equipped with leachate treatment or gas collection systems.
- Waste is being collected door-to-door as well as from commercial and light industrial areas.
- The development of a modern waste management system for Brunei Darussalam began with the rehabilitation of the Sungai Akar dump site into a public park. Part of the development included the construction of 35 gas vents and flare pipes along with a subsoil pipe network to a leachate treatment plant. Before discharging into natural waters, the leachate and septic sludge is broken down in several stages. Phase three of this development plan included the establishment of an energy incinerator provided it passed the required feasibility studies.

Brunei Darussalam, as a member of ASEAN, has ratified the Bangkok Declaration on Combating Marine Debris in ASEAN Region, a commitment to strengthening efforts for

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<sup>17</sup> <https://www.environment.gov.au/protection/waste-resource-recovery/plastics-and-packaging/plastic-microbeads>

<sup>18</sup> <http://www.environment.gov.au/marine/international-activities/pacific-ocean-litter-project>

<sup>19</sup> <https://www.apec.org/Publications/2009/04/Understanding-the-Economic-Benefits-and-Costs-of-Controlling-Marine-Debris-In-the-APEC-Region>

<sup>20</sup> <http://amdi.tangaroablue.org/>

<sup>21</sup> S. Shams et al., 'Integrated and Sustainable Solid Waste Management for Brunei Darussalam' (IET, 2014), 2, doi: 10.1049/cp.2014.1066.

marine debris reduction.<sup>22</sup> Under its National Development Plan,<sup>23</sup> Brunei Darussalam has planned to reduce waste by increasing the recycling rate in the economy. This can be achieved through the introduction of an integrated waste management system and more landfill disposal sites at certain locations.

The key preventive measure for marine debris in Brunei Darussalam was the introduction of the ‘No Plastic Bag Weekend’ campaign which restricted the use of polythene plastic bags from Friday to Sunday. The initiative has now been extended to include all days of the week, through the ‘No Plastic Bag Everyday’<sup>24</sup> initiative. This initiative is part of the government policy on zero waste which also aims to gradually phase out the import of plastic bags, and their distribution at retail outlets.<sup>25</sup>

The following are some regulations concerning sea pollution in Brunei Darussalam:<sup>26</sup>

- The Prevention of Pollution of the Sea Order (2005) – gives effect to the International Convention for the Prevention of Pollution from Ships, 1973; regulates the prevention, reduction and control of pollution of the sea and pollution from ships in line with international agreements.
- The Prevention of Pollution of the Sea Regulations – requires inspection of all ships to verify the validity of their Certificate for the Carriage of Noxious Liquid Substances in Bulk.
- The Prevention of Pollution of the Sea (Reporting of Pollution Incidents) Regulations – obligates the master of the ship to report discharges of harmful substances into any part of the sea.
- Prevention of Pollution of the Sea (Garbage) Regulations – prohibits the disposal of all plastics into the sea outside special areas, 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. While for within special areas, it also includes all other garbage, including paper products, rags, glass, metal, bottles, crockery, dunnage, lining and packing materials.

Campaigns on anti-littering and reduction of use of disposable and styrofoam products (i.e., containers) were launched to prevent marine debris at the source.<sup>27</sup> Brunei Darussalam also plans to introduce the ‘polluter pays principle’ to promote environmental accountability.<sup>28</sup>

According to Ahmad et al., it is necessary for the government to formulate legislation in line with the existing global standards to protect the environment.<sup>29</sup> This may include laws enforcing stricter waste management, allowing only non-recyclable materials into landfills,

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<sup>22</sup> <https://asean.org/storage/2019/06/2.-Bangkok-Declaration-on-Combating-Marine-Debris-in-ASEAN-Region-FINAL.pdf>

<sup>23</sup> <http://www.mod.gov.bn/Shared%20Documents/LATEST%20SP%202018%20-%202023.pdf>

<sup>24</sup> <http://annx.asianews.network/content/monday-added-%E2%80%98no-plastic-every-day%E2%80%99-initiative-brunei-88906>

<sup>25</sup> N.A. Ahmad et al., ‘Brunei’s Sustainable Measures for a Successful Environmental Development’, *Asian Journal of Legal Studies in Environment* (31 August 2016).

<sup>26</sup> Ahmad, ‘Brunei’s Sustainable Measures for a Successful Environmental Development’.

<sup>27</sup> <http://www.env.gov.bn/SitePages/No%20Styrofoam.aspx>

<sup>28</sup> <http://www.env.gov.bn/SitePages/Don't%20Destroy%20Our%20River.aspx>

<sup>29</sup> Ahmad, ‘Brunei’s Sustainable Measures for a Successful Environmental Development’.

mandatory source separation, and recycling efforts as well as the usage of recycling bins. Additionally, Lyons, Su and Neo recommend research activities to survey, monitor and identify sources and hotspots of marine plastics in Brunei Darussalam.<sup>30</sup>

### 3.3 CANADA

Canada has a comprehensive legal framework to contribute to plastic pollution reduction and protection of the environment, species and habitat. Notably, Canada has banned the import, manufacture and sale of plastic-microbead containing toiletries used to exfoliate and cleanse. This is complemented by waste management and pollution legislation and programmes at the subnational level, such as Extended Producer Responsibility and anti-litter laws. Waste management – collection, storage, transportation, treatment (recycling and composting) and disposal (primarily landfill) – is a shared responsibility of all levels of government.

Canada also implements its obligations under the key international agreements related to waste and reducing marine pollution, including the Basel Convention, the International Convention for the Prevention of Pollution from Ships (MARPOL), the London Convention and Protocol and the UN Convention on the Law of the Sea. Canada has also adopted supporting international commitments such as the Food and Agriculture Organization of the United Nations (FAO) Code of Conduct for Responsible Fisheries, the UN Environment Assembly Resolutions and marine litter action plans under the G7, G20 and International Maritime Organization.

Canada has a strategic approach to move toward its zero plastic waste vision with collaboration from the government, industry, non-profit organisations, the public and others with the implementation of various economy-wide initiatives.

Canada championed the Ocean Plastics Charter under its G7 presidency in 2018, bringing together leading governments, businesses and civil organisations to commit to take actions to reduce plastic pollution, and take a more resource-efficient and lifecycle approach to plastic stewardship, on land and at sea. In support of the Ocean Plastics Charter, Canada has announced CAD 100 million in funding to address marine plastic litter, including CAD 6 million for the World Economic Forum Global Plastic Action Partnership (GPAP), CAD 65 million through the World Bank PROBLUE fund to address plastic waste in developing countries and CAD 20 million for an International Plastics Innovation Challenge.

Complementing the Ocean Plastics Charter, Canada launched the Canada-wide Strategy on Zero Plastic Waste which outlines 10 areas of action to keep all plastics in the economy and out of landfills and the environment. The Strategy focuses on a lifecycle approach through greater prevention, collection and value recovery to develop a more circular plastic economy and to reduce plastic pollution.

In June 2019, Canadian Environment Ministers released the first of two phases of the Action Plan on Zero Plastic Waste. Phase 1 will focus government efforts across a broad range of activities including achieving consistent Extended Producer Responsibility programmes; a

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<sup>30</sup> Lyons, Y., T. Su and M.L. Neo, 'A Review of Research on Marine Plastics in Southeast Asia: Who Does What?' (2019) <https://www.gov.uk/government/publications/a-review-of-research-on-marine-plastics-in-sea-who-does-what>



roadmap to address single-use and disposable plastics; support for recycling infrastructure and innovation in plastics manufacturing; and tools for green procurement practices. Phase 2, coming in 2020, will identify actions to: improve consumer, business and institutional awareness; reduce waste and pollution from aquatic activities; advance science; capture and clean up debris in the environment; and contribute to global action.

To contribute to the Strategy and the Ocean Plastics Charter, Canada is taking major steps to reduce plastic pollution and drive ambitious action from governments and businesses across the economy. Actions include working with provinces and territories to develop consistent Extended Producer Responsibility programmes; investing in innovative Canadian technologies and global solutions to address plastic pollution, including providing over CAD 10 million to SMEs to develop Canada-made solutions to reduce plastic waste; reducing plastic waste from federal operations, by diverting 75 percent of plastic waste by 2030, eliminating unnecessary use of single-use plastics in operations, meetings and events and purchasing more sustainable products; supporting community-led action and citizen-science activities; working with industry to prevent and retrieve abandoned, lost or discarded fishing gear; and accelerating research on the lifecycle of plastics and the impact on human and ecological health.

Canada plans to ban single-use plastics that cause harm (where warranted and based on scientific evidence) and to take other actions to reduce plastic waste. The development of any regulatory measures, including which products will fall under the single-use definition, will be informed by science and socioeconomic considerations. Stakeholders will be consulted throughout the development, management and review of potential regulations.

In support of new innovative technologies to tackle marine debris, Canada provided funding for projects in areas such as food packaging, construction waste, marine vessels and fishing gears. Beside technologies, Canada also funds education and awareness-raising projects, clean-up and fishing gear removal activities, community projects, and research on marine debris and plastics.

Canada is also advancing science to fill priority research gaps and provide the evidence needed to support decision making. In June 2018, the Canadian Plastics Science Agenda was published, providing a framework that spans the lifecycle of plastics to inform future science and research investments in detecting plastics in the environment; understanding and mitigating potential impacts on wildlife, human health and the environment; and advancing sustainable plastic production, recycling and recovery.

### **3.4 CHILE**

Chile has several laws and regulations on the proper management of land-based waste, including collection, sorting, recycling, storage, transportation and disposal of general and domestic wastes, which may indirectly lead to marine debris pollution. Specific laws and regulations that address marine debris pollution include the prevention of illegal dumping of wastes (e.g., from ships or aquaculture facilities) into waterways or at beaches.

Chile has adopted several international conventions, including MARPOL, the London Convention and the UN Convention on the Law of the Sea for management of marine debris. Chile has also established a National Work Group to address marine debris and microplastics issues.

Chile's main sources of land-based marine debris are household and general litter, while sea-based marine debris largely arise from illegal dumping of plastic by the aquaculture industry.

Chile's main preventive measure for marine debris is a law that prohibits the sale of plastic bags in its coastal areas. Reduction in plastic usage will decrease the amount of plastics that will end up in the sea. Another measure is to increase awareness of the impact of marine debris on the environment. This is done through campaigns organised by non-governmental organisations (NGOs) or private organisations with government support.

A key remedial measure for marine debris in Chile, like many other economies, is its beach clean-up programmes. The most recognised is an economy-wide event, conducted during the International Coastal Cleanup, that is organised by The General Directorate of the Maritime Territory and Merchant Marine (DIRECTEMAR). Other remedial measures adopted by Chile include:

- Establishment of programmes for the identification and mapping of marine debris across the coastline of Chile
- Promotion of collaboration between private, public and academia for monitoring and collection of marine debris
- Strengthening enforcement of MARPOL Annex V (e.g., marking and disposal of fishing gears)
- Increasing awareness within the aquaculture, fishery and shipping industries (i.e., the top polluters in terms of marine-based debris in Chile)
- Provision of adequate waste reception facilities onshore
- Development of voluntary programmes for plastic packaging reduction on board shipping vessels.

Starting in 2019, Chile's Maritime Authority has been monitoring anthropogenic litter at 13 beaches with the support of marine biologists and environmental engineers from the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP).

Plastic waste in Chile is collected, transported and disposed of together with the rest of the waste generated at the household level, mainly to be disposed of in landfills. Along with the above, there are systems of voluntary delivery, through green points or clean points where polyethylene terephthalate (PET) plastic could be dropped off for subsequent recycling.

Chile has made a public pledge to move toward a 'new plastics economy', and in October 2018 it signed the Global Commitment of the New Economy of Plastics to implement measurable policies and report tangible progress by 2025.

### **3.5 CHINA**

Municipal solid waste generated in China is increasing due to its large population, economic growth and rapid urbanisation. China had been for decades the world's largest waste importer, until the recent import ban on solid wastes including plastics, unsorted paper and textile. China has since shifted its focus toward better municipal waste management.

China has laws that govern proper waste management, including laws on source reduction, collection, sorting, recycling, storage, transportation, treatment and disposal. Its legal

framework on marine waste management includes laws that aim to reduce both land- and sea-based debris. For example, the disposal of garbage on beaches and seashores is prohibited; and all vessels and ports within China's jurisdiction are required to have garbage storage facilities and measures to prevent any waste discharge into the sea.

China is part of the international convention, MARPOL, and has incorporated regulations relevant to marine debris prevention into its domestic legislation. An example is the provision of adequate waste facilities at ports and terminals to meet the needs of arriving ships. Other conventions signed by China include the London Convention, the UN Convention on the Law of the Sea and the Basel Convention.

China has highlighted in the survey that the main sources of land-based marine debris are household and general litter, while sea-based marine debris is from the aquaculture industry.

Key preventive measures for land-based marine debris are enforcement of laws on illegal waste dumping in waterways and use of prohibited materials (e.g., foam floats). Water policemen are deployed to patrol the waterways to prevent illegal dumping of waste into the sea, but this may not be effective for rural streams that are inaccessible. To mitigate marine debris at its source, China restricts the use of disposable plastic bags (thickness <0.025mm) and promotes the use of recyclable and biodegradable plastics. Additionally, China plans to implement mandatory domestic solid waste classification and treatment systems.

China provides funding for studies on plastic product substitution and alternative packaging that can biodegrade in the environment. Financial support is provided to municipalities to improve solid waste management technologies. China also provides financial support to central and provincial governments to prevent and control marine pollution (e.g., Blue Bay Action Plan).

Remedial measures for China include conducting clean-ups or submarine debris salvage by targeting areas with large amounts of marine debris, such as mangroves and specific sea areas including harbours and aquaculture sites. To understand the extent of marine debris pollution, China conducts beach surveys, and submarine and sea surface trawls at its environmental monitoring stations.

The current practice in China for plastic waste is to recycle valuable plastics while disposing those of low economic value in landfills. With the development of plastic waste classification (or sorting), the proportion of waste being incinerated and recycled has increased. The measure to increase plastic recycling is economy-wide and requires collaboration between garbage recyclers, consumers and local governments.

### **3.6 HONG KONG, CHINA**

Hong Kong, China has set up an interdepartmental working group to focus on the discussion and handling of marine debris and marine environmental incidents, and to enhance cooperation between government departments.<sup>31</sup> The working group has formulated a three-pronged long-term strategy to tackle the marine debris problem: reducing waste generation at the source, preventing refuse from entering the marine environment and removing refuse from the marine

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<sup>31</sup> [https://www.epd.gov.hk/epd/clean\\_shorelines/node/12.html](https://www.epd.gov.hk/epd/clean_shorelines/node/12.html)

environment.<sup>32</sup> Since the establishment of the working group in 2012, additional efforts and resources have been devoted to enhance debris clean-up at sea and along coastlines; enforce laws against littering at sea; organise and support various community activities and awareness programmes on clean shorelines; and provide facilities and supportive measures to prevent waste from entering the sea.

To tackle waste generation at the source, Hong Kong, China conducts community education and improves awareness of the importance of keeping shorelines clean. Its efforts include making promotional videos and organising beach clean-up activities and roving exhibitions aimed at instilling habit changes, thus reducing waste and preventing it from entering the sea. Funding is allocated through the Environment and Conservation Fund (HKD 10 million in 2019/2020) to support community projects related to clean shorelines.

To encourage the participation of community organisations and volunteers, Hong Kong, China has established a Clean Shoreline Liaison Platform with different media and channels to coordinate and promote shoreline clean-up actions, provide support to related activities and share the clean-up results.

Various government departments in Hong Kong, China are taking measures to prevent the release of waste into the marine environment. Measures taken include providing waste recycling bins at piers and promenades; conducting trial deployments of waste-trapping devices at stormwater channels; and taking preventive measures at wholesale fish markets, for example, setting up foam box collection points, installing barriers along seawalls and promoting recycling.

Different government departments are responsible for cleaning up the sea, beaches, marine parks and other coastal sites. Locations that are more prone to refuse accumulation and require dedicated actions to remove debris are identified as priority sites and are subject to enhanced cleaning frequency. Cleaning efforts at non-priority sites will be strengthened according to need. In 2018, a total of 15,460 tonnes of marine debris were collected.

In terms of regional cooperation, the Hong Kong–Guangdong Marine Environmental Management Special Panel was set up to enhance exchange and communication through regular meetings on various regional marine environmental matters. The Special Panel established a notification and alert mechanism allowing one side to notify the other of possible surges of marine debris due to heavy rain or other environmental events.

Hong Kong, China is also committed to enhancing its overall waste management programme, with a priority on tackling plastic waste in relation to marine pollution. New initiatives that have already been implemented or are in the pipeline include the Producer Responsibility Scheme, Municipal Solid Waste Charging and a Recycling Fund.

The Producer Responsibility Scheme<sup>33</sup> is a key waste management strategy that requires manufacturers, importers, wholesalers, retailers and consumers to share the responsibility for the collection, recycling, treatment and disposal of end-of-life products to reduce their environmental impacts.

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[https://www.epd.gov.hk/epd/clean\\_shorelines/sites/default/files/common2015/MarineRefuseStudyReport\\_ENG\\_Final.pdf](https://www.epd.gov.hk/epd/clean_shorelines/sites/default/files/common2015/MarineRefuseStudyReport_ENG_Final.pdf)

<sup>33</sup> <https://www.gov.hk/en/residents/environment/waste/management/prs.htm>

The first initiative under the Producer Responsibility Scheme was the Plastic Shopping Bag Charging Scheme in 2009 to reduce indiscriminate use of plastic shopping bags.<sup>34</sup> Another, currently being implemented progressively, promotes recycling of glass beverage containers, turning waste into resource.<sup>35</sup> Hong Kong, China also plans to introduce an initiative focused on plastic beverage containers and will consult the public after working out the proposed framework.<sup>36</sup> In parallel, a pilot scheme on the application of reverse vending machines will be launched to assess their effectiveness in plastic beverage container collection.

Another initiative under the Producer Responsibility Scheme focuses on waste electrical and electronic equipment and aims to provide a long-term solution to potential land contamination and to environmental problems arising from mishandling of regulated electrical equipment (REE) during delivery, storage and dismantling, while encouraging waste reduction and recycling efforts.<sup>37</sup> Consumers with REE will be provided with easy access to recycling facilities while sellers will have to arrange for REE removal for consumers. Suppliers of REE are required to be registered and to pay a recycling levy. Recyclers of REE must obtain a waste disposal licence for storage, treatment, reprocessing or recycling of abandoned REE.

In addition, Hong Kong, China has proposed to implement Municipal Solid Waste Charging based on the quantity of waste generated.<sup>38</sup> The goal of quantity-based waste charges is to create a financial incentive to drive behavioural changes in waste generation and to reduce overall waste disposal.

There is also a Recycling Fund to promote the recovery and recycling of waste by facilitating the recycling industry in upgrading its operational capabilities and efficiency for sustainable development.<sup>39</sup>

### 3.7 INDONESIA

The traditional waste management approach in Indonesia focuses on collection, transport and disposal, with less emphasis on recycling. As such, the focus is usually on the final treatment at the ultimate disposal processing facilities. The current waste management regulation separates waste management into two key activities: (1) waste reduction; and (2) waste management. Waste reduction involves restrictions on waste generation, waste recycling and reuse of potential waste; while waste management includes sorting, collecting, transporting, processing and processing waste.<sup>40</sup> Indonesia implemented a law ordering the closure of all open dumping sites by 2013 and requiring different levels of the government to provide financing to the waste sector (World Bank, 2018).

Indonesia has established a roadmap toward a Clean-from-Waste Indonesia (*Indonesia Bersih Sampah 2025*) which aims to reduce 30 percent of the economy's waste and divert waste from

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<sup>34</sup> [https://www.epd.gov.hk/epd/english/environmentinhk/waste/pro\\_responsibility/env\\_levy.html](https://www.epd.gov.hk/epd/english/environmentinhk/waste/pro_responsibility/env_levy.html)

<sup>35</sup> [https://www.epd.gov.hk/epd/english/environmentinhk/waste/pro\\_responsibility/gprs.html](https://www.epd.gov.hk/epd/english/environmentinhk/waste/pro_responsibility/gprs.html)

<sup>36</sup> <https://www.gov.hk/en/residents/environment/waste/management/prsplastic.htm>

<sup>37</sup> [https://www.gov.hk/en/residents/government/publication/consultation/docs/2010/WEEE\\_Consultation.pdf](https://www.gov.hk/en/residents/government/publication/consultation/docs/2010/WEEE_Consultation.pdf)

<sup>38</sup> <https://www.gov.hk/en/residents/environment/waste/management/mswcharging.htm>

<sup>39</sup> <https://www.recyclingfund.hk/en/overview.php>

<sup>40</sup> <https://nasional.kompas.com/read/2018/11/22/15323351/sampah-dan-plastik-jadi-ancaman-seperti-apa-kebijakan-pemerintah?page=all> [accessed 11 October 2019]

going into landfills.<sup>41</sup> Programmes that have been implemented include the 2020 Zero-Waste Indonesia programme, which introduces regulation on payment for plastic bags, and the Integrated Waste Management Facility for Reduce-Reuse-Recycle (TPST 3R).

A key challenge in waste management in Indonesia is related to low waste collection rates in certain areas – as low as 15 percent. Only 40 percent of solid waste was collected in 2001. Another challenge concerns the lack of funding. Allocations by local governments toward waste management only reach USD 5–6 per capita/per annum, significantly lower than the international benchmark of USD 15–20 per capita/per annum. This lack of investment leads to inefficiencies and much higher operating costs, hence preventing businesses from participating in the sector. Lastly, enforcement of solid waste laws and standards is weak (World Bank, 2018).

Specific to tackling waste that has encroached on the marine environment, Indonesia has established the National Action Plan on Marine Debris, with the aim of reducing 70 percent of marine plastic debris by 2025.<sup>42</sup> Indonesia has collaborated with the Global Plastic Action Partnership (GPAP) to develop a roadmap of solutions which includes reducing over-packaging, inventing recyclable plastic or substitute materials, and increasing recycling and waste collection rates. The Indonesian government implemented a pilot to levy an excise on plastic shopping bags in order to reduce plastic consumption (Rogers, 2018). Efforts are now being made to gain approval for the levy.

The government is currently working to investigate the use of emerging technologies in combatting marine debris. One such effort is to use plastic waste in the construction of asphalt. Several Plastic Tar Road pilots were implemented in 2017 (Purba, et al., 2019).

Marine debris monitoring and mapping<sup>43</sup> are being conducted by a youth NGO, ‘Divers Clean Action’, in collaboration with the Indonesian Institute of Sciences (Lembaga Ilmu Pengetahuan Indonesia).

### **3.8 JAPAN**

Japan has established comprehensive legislation for waste management, including on sorting, recycling, storage, collection, transport, disposal, incineration and composting of wastes. Japan also has specific legal frameworks to address marine debris, including prevention of waste discharge from ships and offshore facilities, and measures to promote the smooth treatment of marine debris and effective reduction of its generation.

Japan adopted some measures from international treaties to address marine debris issues, including MARPOL, the London Convention and 1996 Protocol, and the Ballast Water Management Convention. Restrictions defined in these conventions are secured by the domestic law relating to the Prevention of Marine Pollution and Maritime Disaster.

To prevent marine plastic pollution, Japan has initiated the Resource Circulation Strategy for Plastics, which aims to attain marine plastic zero emission through emphasis on the 3Rs

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<sup>41</sup> <https://waste4change.com/everything-you-need-to-know-about-clean-from-waste-indonesia-2025/>

<sup>42</sup> [https://www.giz.de/de/downloads/giz2018\\_Indonesia-Country-Profile\\_web.pdf](https://www.giz.de/de/downloads/giz2018_Indonesia-Country-Profile_web.pdf)

<sup>43</sup> <https://marinedebris.id/Sea>

(reduce, reuse and recycle); proper waste handling; prohibition of littering and illegal dumping; and promotion of clean-up activities.

Japan developed the National Action Plan for Marine Plastic Litter to realise a world without additional pollution by plastic litter. Measures from the action plan include:

- Promotion of a proper waste management system
- Prevention of littering, illegal dumping and unintentional leakage of waste into the oceans
- Collection of scattered waste on land
- Recovery of plastic litter from the oceans
- Innovation in development of alternative materials
- Collaboration with stakeholders
- International cooperation for promoting measures in developing economies
- Survey of the actual situation and the accumulation of scientific knowledge

Additionally, Japan's Ministry of the Environment funded research on marine plastic litter conducted by Kyushu University from 2018 to 2020. The research aims to understand the distribution of plastics in the ocean from its coasts to a global scale; the ecological impact of marine plastics; and improved measuring methods for marine plastics.

Partnerships and joint efforts among the government, private institutions and the public have also been established to improve prevention of marine debris pollution. For example, the Marine Plastic Public Private Innovation Partnership was set up to support the development of innovations such as substitute materials. An economy-wide clean-up campaign, UMIGOMI Zero Week, which was organised as a joint effort with the Nippon Foundation, recorded more than 400,000 participating to reduce marine waste.

Marine debris monitoring is implemented under the Act on Promoting the Treatment of Marine Debris Affecting the Conservation of Good Coastal Landscapes and Environments to Protect Natural Beauty and Variety and Marine Environment.<sup>44</sup> Besides beach debris, Japan monitors floating debris and seabed debris in the ocean. As part of the Act, the federal and local governments must endeavour to conduct periodic investigations into the circumstances and causes of marine debris in order to promote effective policies required for the control of marine debris generation.

### **3.9 KOREA**

Korea has legislation governing proper waste management including collection, storage, transportation, treatment and disposal. Its legislation specific to marine debris includes regulations on the prevention of waste discharge into the sea. Some measures in Korea's legislation are adopted from international conventions such as MARPOL. Other international conventions Korea is a party of include UN Convention on the Law of the Sea and the London Convention.

The main sources of land-based marine debris in Korea are derived from tourism and coastal recreation activities, while sea-based marine debris is mainly derived from fishing activities.

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<sup>44</sup> [https://www.env.go.jp/en/recycle/smcs/4th-f\\_Plan.pdf](https://www.env.go.jp/en/recycle/smcs/4th-f_Plan.pdf)

The Management Strategy for Marine Plastic Waste was established in May 2019 to reduce 50 percent of the current marine plastic volume by 2030. This goal is to be achieved through the establishment of action plans, including on reducing waste by targeting sources of marine plastic waste; improving the collection of marine plastic from ships; expediting processing and recycling of marine plastic; strengthening foundations for plastic waste management, and improving social perception of marine waste (awareness training). For example, Korea introduced the Comprehensive Strategy for Management of Recyclable Waste to improve product lifecycle planning, including manufacturing, distribution, collection and recycling.

The main preventive measures implemented include:

- Restriction on use of plastic packaging (and voluntary reduction of packaging by major distribution companies)
- Prevention of the sale of plastic bags at departmental stores, retail stores, large shopping facilities
- Reduction of disposable products to minimise waste generated and the collection of garbage from major streams in Korea

These policies and measures developed by Korea follow a systematic approach, are tailored to local circumstances, and consider the budget as well as feedback from stakeholders (e.g., experts and environmental groups).

The main remedial actions by Korea are beach clean-ups and collection of floating waste from the ocean. These clean-up activities involve local governments, voluntary groups and public institutions. An example is the implementation of a coastal clean-up programme by the Korea Ocean Environment Management Corporation (KOEM). Since collected marine debris mostly originates from fishery-related activities, education and awareness-raising among fishers have been established. Fishers are also compensated for collecting debris found during fishing or voluntary collection of discarded fishing gear. Marine debris is monitored as part of these beach clean-up activities by various public and private organisations, and voluntary groups.

Korea also has the Marine Product Development Fund, which allocates funds for marine waste treatment projects. Research on the environmental risk of marine plastic is being conducted by the Korea Institute of Ocean Science and Technology (KIOST); it is surveying domestic pollution caused by marine microplastics and analysing its influence on marine organisms.

### **3.10 MALAYSIA**

In 2005, Malaysia adopted the National Strategic Plan for Solid Waste Management 2005–2020, which contains the following principles:<sup>45</sup>

- Federalisation of the solid waste management function
- Privatisation of the solid waste management service
- Sustainable waste management through reduction, reuse and recycling with the use of appropriate technologies, facilities and equipment to provide a sustainable and comprehensive solid waste management service
- Adoption of service standards

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<sup>45</sup> United Nations Development Programme (UNDP), ‘Malaysia Developing a Solid Waste Management Model for Penang’ (Kuala Lumpur: UNDP, 2008).



- Cooperation across different levels of the government
- Development of a social framework for increasing public awareness, building partnerships across different stakeholders, considering social equity in relation to charges, and developing technical and managerial capabilities in solid waste management.

Malaysia has adopted numerous preventive strategies, including a 3R campaign and ‘No Plastic Bags’ days where a charge is levied on their use. Some states have further embraced the ‘No Plastic Bags’ campaign by extending it to all days of the week.<sup>46</sup>

Malaysia has established a phased and holistic approach toward managing single-use plastic pollution through its Roadmap Towards Zero Single-use Plastics 2018–2030.<sup>47</sup> The action plans for the Roadmap include introducing a levy on plastic manufacturers; creating a circular economy for single-use plastics; providing incentives for eco-friendly alternatives; conducting research and development on plastic alternatives; and promoting communication, education and public awareness. The Roadmap will first target introducing pollution charges on plastic straws and bags, and subsequently, on plastic containers and cutlery.

The Green Technology Financing Scheme was introduced in 2010 to create enabling conditions for the growth of a green economy. In addition to an approved financing amount, the scheme also provides capped interest rate rebates on loans from participating financial institutions (Yatim, Ngan, & Lam, 2017).

According to a study by the United Nations Environment Programme (UNEP) in 2017,<sup>48</sup> Malaysia is currently designing an Extended Producer Responsibility-based policy regime to encourage producers to take responsibility for collecting, recycling and disposing waste.

There are several key challenges related to waste management in Malaysia, including the lack of reliable data on waste composition and generation, low recycling rates, continued usage of landfills, and low public participation.<sup>49</sup>

### 3.11 MEXICO

The General Act for Ecological Protection of the Environment (LGEEPA) enacted in 1988 is the key environmental legislation in Mexico. It promotes (1) the right of every person to live in an environment that is appropriate to self-development, wellbeing and health; (2) the principles of environmental policy and instruments to ensure the preservation, restoration and improvement of the environment; (3) the preservation and protection of biodiversity; (4) the

<sup>46</sup> A. Pariatamby, ‘State of the 3Rs in Asia and the Pacific, Country Chapter: Malaysia’ (Secretariat of the Regional 3R Forum in Asia and the Pacific, United Nations Centre for Regional Development (UNCRD) and Institute for Global Environmental Strategies (IGES), November 2017).

<sup>47</sup> <https://www.mestec.gov.my/web/wp-content/uploads/2019/03/Malaysia-Roadmap-Towards-Zero-Single-Use-Plastics-2018-20302.pdf>

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[https://wedocs.unep.org/bitstream/handle/20.500.11822/21134/waste\\_mgt\\_asean\\_summary.pdf?sequence=1&mp%3BisAllowed=](https://wedocs.unep.org/bitstream/handle/20.500.11822/21134/waste_mgt_asean_summary.pdf?sequence=1&mp%3BisAllowed=)

<sup>49</sup> J. Sreenivasan et al., ‘Solid Waste Management in Malaysia – A Move Towards Sustainability, Waste Management – An Integrated Vision’ (IntechOpen, 26 October 2012), <https://www.intechopen.com/books/waste-management-an-integrated-vision/solid-waste-management-in-malaysia-a-move-towards-sustainability>; Pariatamby, ‘State of the 3Rs in Asia and the Pacific, Country Chapter: Malaysia’.

establishment and management of natural protected areas; (5) the sustainable utilisation, preservation and restoration of soil, water and other natural resources in a way that allows for economic profits and social activity together with ecosystem preservation; and (6) the prevention and control of air, water and soil pollution.<sup>50</sup>

According to Vega et al., the urban cleaning systems in Mexico consist of the following elements:<sup>51</sup>

- Storage in the generating source: In the form of temporary waste storage facilities in homes, stores, industries, markets and hospitals.
- Manual and mechanical sweeping: Mostly done using wheelbarrows or carts with metal barrels, brooms, brushes and collecting pans. Those done mechanically with sweeping machines are usually used in main avenues, shopping areas and speedways.
- Garbage collection: 84 percent is collected by waste collection services, with around 50 percent having adequate final disposal. This happens generally in metropolitan areas and medium-sized cities. The majority of cities are not equipped with a route design; and municipalities suffer from insufficient resources and planning to increase adequately the collection scope, especially in peripheral locations.
- Transportation and transfer: Consist of the collection vehicle's full trip until the treatment or final disposal site, and the municipal waste system's transportation to the transfer sites for subsequent transfer to the treatment or final disposal site. In large metropolitan areas, more than 75 percent of the collected waste is transported using a transfer station.
- Treatment and final disposal: Most of the collected waste ends up in controlled open-air dumps or (sanitary) landfills.

Key challenges in the urban cleaning system and municipal solid waste include deficient or poor quality home storage (may result in leaks when being transported to the collection trucks); inefficient collection routes; high cost of land; the population's rejection of the construction of landfills; and lack of control and sanitary standards in the final disposal sites posing significant health and environmental risks.<sup>52</sup>

With respect to improving marine debris management, the following issues are seen to be high on the agenda:<sup>53</sup>

- Lack of data and information concerning the definite or official number of islands, cays or reefs, and on the exact length of its coastline, has led to jurisdictional problems between different levels of government.
- Ineffective domestic policies are worsened because international conventions hold little power over specific domestic policies and are only allowed jurisdiction when other economies have not fulfilled their obligations to protect and preserve their ecosystems.

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<sup>50</sup> Cartron et al., 2005, cited in: B.R. Rupe, 'Domestic and International Environmental Policy in Mexico: Compounding Issues for the Marine Environment' (MA thesis, University of Iowa, 2014), <https://doi.org/10.17077/etd.ntihs4ga>.

<sup>51</sup> C. Vega et al., 'Waste Management System in Mexico: History, State of the Art and Trends', *Journal of Solid Waste Technology and Management* (January 2006).

<sup>52</sup> Vega et al., 'Waste Management System in Mexico: History, State of the Art and Trends'.

<sup>53</sup> Rupe, 'Domestic and International Environmental Policy in Mexico'.

- Fragmented decision-making procedures with duplication and overlap, preventing interagency cooperation and the development of an effective ocean policy.
- Lack of domestic standards to regulate marine debris pollution, to gauge the areas in need of mitigation and to assess overall success of debris pollution abatement measures.

Mexico is working toward gradually reducing single-use plastic products and packaging. Most progress has been made at the state level. States like Mexico City, Baja California and several others have already implemented or are working toward implementing bans on the use of single-use plastics in commercial establishments and on the distribution of polystyrene (Lovells, 2019). The bans will be phased in over time to allow businesses to find alternatives to single-use plastics.

Recently, the Mexican government has started to focus on tackling marine pollution through education. A publication providing people with information on several marine issues is published on the government website on a biweekly basis.<sup>54</sup> The Mexico City government also announced the implementation of the 2019–2014 environment and climate change programme with 145 billion pesos (USD 7.3 billion) in investments. The programme will focus on efforts to clean up local rivers and water sources, and turn the city into a zero-waste area, among others.<sup>55</sup>

### 3.12 NEW ZEALAND

New Zealand has established a legal framework for waste management that includes collection, storage, transportation, treatment and disposal. Specific laws and policies are also in place to address marine debris pollution through prevention of waste dumping at coastal marine areas (including from any ships and offshore facilities) and a ban on single-use plastic shopping bags.

International conventions such as MARPOL, the London Convention, the Basel Convention and the UN Convention on the Law of the Sea have been adopted in New Zealand laws to restrict discharges and dumping into the marine environment.

Several measures were implemented through regulations under the Waste Minimisation Act to target reduction of marine debris at the source. For example, the Act bans the use of single-use plastic shopping bags and applies to all new single-use plastic shopping bags with handles that are made of plastic up to 70 microns thick.<sup>56</sup> The Act also bans the sale and manufacture of wash-off products containing plastic microbeads.

Government funding plays an essential role in New Zealand’s strategy to reduce marine debris pollution. The Waste Minimisation Act also imposes a levy on all waste disposed into landfills to generate funding to help the local government, communities and businesses minimise waste. Half of the levy money goes to territorial authorities (city and district councils) to spend on promoting or implementing the waste minimisation activities set out in their Waste Management and Minimisation Plans. The remaining levy money (minus administrative costs) is put into a Waste Minimisation Fund for waste minimisation initiatives. Examples of projects that have received funding include Keep New Zealand Beautiful and Sustainable Coastlines. Additionally, New Zealand has provided a Wellbeing Budget to help the Ministry for the

<sup>54</sup> ‘Nuestro Ambiente’, Gobierno de Mexico, n.d., <https://www.gob.mx/semarnat/documentos/nuestro-ambiente?idiom=es>

<sup>55</sup> <https://www.bnamericas.com/en/features/mexico-city-outlines-us7bn-environment-climate-change-plan>

<sup>56</sup> <https://www.mfe.govt.nz/waste/single-use-plastic-shopping-bags-banned-new-zealand/>

Environment improve resource efficiency and shift New Zealand to a zero-waste economy. Besides the government, institutions have also provided numerous funding opportunities for driving innovations in addressing marine debris issues.

New Zealand has developed materials recovery and local re-processing facilities to shift toward a more efficient circular economy, where products are designed to have a long life and materials can be easily recovered, reused, recycled and remanufactured.

In general, the marine debris preventive measures that are most relevant to New Zealand include improved enforcement to tackle improper disposal into waterways, the ban on certain items or materials, and implementation of deposit-refund schemes (e.g., Extended Producer Responsibility). New Zealand has also participated in Operation Clean Sweep and developed guidelines to help manufacturers and distributors prevent loss of plastic pellets to the environment.

Remedial measures adopted by New Zealand to address marine debris pollution are beach and seafloor clean-up activities. These clean-up activities are conducted by international and charitable organisations (e.g., Sustainable Coastlines, Ghost Fishing New Zealand and Project Baseline) with volunteers. Marine debris monitoring data collected during these activities are made publicly available.

### **3.13 PAPUA NEW GUINEA**

The Environment Act 2000 is the key legislation for environmental protection in Papua New Guinea. It regulates the environmental impacts of development activities and the management of domestic water resources. Its implementation involves several environmental regulations under the Department of Environment and Conservation through the Conservation and Environment Protection Authority and also allows provincial and local governments to develop environmental legislation, policies and bylaws for waste management.<sup>57</sup> The Asian Development Bank notes in a 2014 report that the regulatory framework could be improved by having a single legislative document to facilitate more effective planning, management and operation of the solid waste management sector as well as to enhance policies and guidelines for effective operations in cities.<sup>58</sup>

Local governments are solely responsible for the supply of waste management services, for which they may levy local taxes and charges to cover expenses with limited support from the central government. However, the revenue collection rates are low resulting in many communities suffering from lack of efficient and regular collection services (PRIF, 2018). Additionally, despite the large geographic area, there are no transfer stations. Moreover, illegal dumping and burning of waste are quite common due to the lack of public awareness and education.<sup>59</sup>

Specific to the marine environment, Papua New Guinea has the Dumping of Waste at Sea Act 1979, which regulates the issuance of permits to vessels and specifies penalties for

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<sup>57</sup> Pacific Region Infrastructure Facility (PRIF), 'Papua New Guinea Country Profile' (2018).

<sup>58</sup> Asian Development Bank (ADB), 'Solid Waste Management in the Pacific: Papua New Guinea Country Snapshot' (Manila: ADB, 2014), <https://www.adb.org/sites/default/files/publication/42664/solid-waste-management-png.pdf>

<sup>59</sup> ADB, 'Solid Waste Management in the Pacific: Papua New Guinea'.

noncompliance. Additionally, the Prevention of Pollution of the Sea Act 1979 and Prevention of Pollution at Sea Regulation 1980 regulate oil and other substances and give effect to a number of international conventions (PRIF, 2018). Papua New Guinea is also in a multilateral partnership, the Coral Triangle Initiative – along with Indonesia; Malaysia; the Philippines; the Solomon Islands; and Timor-Leste – which aims to carry out sustainable management of marine resources.<sup>60</sup> Papua New Guinea also adopted the Solid Waste Management Strategy for the Pacific 2010– 2015 which embraces the integrated solid waste management principle, covering the 4Rs (refuse, reduce, reuse, recycle), collection and disposal (SPREP, 2010).

There is a lack of plastic recycling infrastructure in Papua New Guinea.<sup>61</sup> Like many other economies, it has imposed a ban on importing or manufacturing single-use plastic bags.<sup>62</sup> Due to the lack of compliance with this ban, Papua New Guinea has extended the ban to all plastic bags, including biodegradable ones. Manufacturers who wish to continue to import or produce plastic bags are required to pay a levy to cover costs of managing plastic waste.<sup>63</sup>

### 3.14 PERU

Peru has several laws and regulations on proper waste management including on collection, sorting, recycling, storage, transportation and disposal. The main laws and regulations to prevent marine debris pollution prohibit discharge of wastes from ships and provide aquaculture facilities in marine waters. Peru is also part of international conventions such as MARPOL, the UN Convention on the Law of the Sea and the London Convention.

Peru's main source of land-based marine debris is domestic effluents while the main source of sea-based marine debris is residual effluents from offshore industries.

Regarding preventive measures for plastics, Peru has promulgated laws to encourage governmental entities to reduce use of single-use plastics and instead use biodegradable plastics. Several Natural Protected Areas have also prohibited the use of single-use plastics. The distribution of plastic bags to commercial stores and markets has been restricted as well. Furthermore, the Ministry of Environment of Peru has launched a website to recognise companies that sell eco-friendly alternatives to plastic products, or that avoid the use of plastics in their production processes and packaging.

Preventive measures for sea-based plastic wastes include surveillance of fishing vessels by Peru's Authority to prevent waste disposal, and awareness training on proper plastic waste management for artisanal fishers. Fishing plants that have installed submarine emissaries for discharging their effluents into the marine environment have to ensure that the effluents are treated before being discharged; these effluents are processed through treatment systems (in industrial establishments) approved in environmental impact studies. These industrial fishing plants are supervised by the Environmental Assessment and Control Agency (OEFA), which verifies that the treated effluents comply with the maximum permissible limits.

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<sup>60</sup> Lyons, Su and Neo. 'A Review of Research on Marine Plastics in Southeast Asia'.

<sup>61</sup> <https://www.theprif.org/documents/papua-new-guinea-png/waste-management/papua-new-guinea-png-profile-solid-waste-and>

<sup>62</sup> <https://www.rnz.co.nz/international/pacific-news/355385/png-imposes-full-ban-on-plastic-shopping-bags>

<sup>63</sup> <https://postcourier.com.pg/environment-levy-imposed-plastic-bags/>

Funding for the management of municipal waste and its disposal are available at the local and provincial levels. Research has focused on assessing the impact of microplastics on Peruvian coastal biodiversity, human health and the sustainability of fisheries' activities in the Peruvian seas.

Peru also conducts beach and seabed clean-ups at critical areas (hotspots) as remedial measures for marine debris. The Ministry of Production develops seabed clean-up programmes for bays with the participation of divers, artisanal fishers, the Ministry of Environment and schools, among others. Peru is also considering the development of a more severe law against offenders responsible for marine debris pollution. Marine debris monitoring is conducted as part of the beach survey on the International Coastal Cleanup.

The Directorate General of Environmental Fisheries and Aquaculture of the Ministry of Production (DGAAMPA-PRODUCE) conducts environmental awareness workshops aimed at artisanal fishers, owners of fishing companies, professionals and the public in general. These annual workshops are held economy-wide and oriented toward the proper management of solid waste, marine debris and single-use plastic bags as well as the use of hydrobiological waste.

### 3.15 THE PHILIPPINES

The Philippines enacted the Ecological Solid Waste Management Act of 2000 to regulate proper solid waste management at the local government level. The Act recognises the local government unit as the lead implementing agency and aims to achieve a 25 percent waste reduction by 2010 through the establishment of material recovery facilities in all barangays (the lowest level political and administrative body) on the basis of the 3R principle. The Act also prohibited the use of open dumping and encouraged the development of sanitary landfills.<sup>64</sup>

As the Act relies on local governments, Premakumara et al. argue that strong political commitment at the local government level along with adequate allocation of financial and organisational resources is crucial.<sup>65</sup> Thus, active participation and partnership with businesses and NGOs are also important to ensure the sustainability of the programme.

McKinsey & Company and Ocean Conservancy report that the Philippines has high waste collection rates: 85 percent economy-wide, near 90 percent in some dense urban areas, and above 40 percent for some very rural areas.<sup>66</sup> This could be attributed to the extensive involvement of local communities. Nevertheless, in 2018, more than 900 open dump sites were reported to still exist, and many secondary cities and remote islands still did not have waste collection services, and scant waste segregation and recycling efforts,<sup>67</sup> enabling leakages into the ocean. According to McKinsey & Company and Ocean Conservancy, there are two main drivers of plastic leakage: uncollected waste (75%) and leakages from within the waste-

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<sup>64</sup> Antonio, 2008, cited in: D.G. J. Premakumara et al., 'Policy Implementation of the Republic Act (RA) 9003 in the Philippines: A Case Study of Cebu City' (*The 1st IWWG-ARB Symposium*, Hokkaido, Japan, 18–21 March 2013).

<sup>65</sup> Premakura et al., 'Policy Implementation of the Republic Act (RA) 9003 in the Philippines'.

<sup>66</sup> McKinsey & Company and Ocean Conservancy, 'Stemming the Tide: Land-based Strategies for a Plastic-free Ocean' (McKinsey & Company and Ocean Conservancy, 2015), <https://oceanconservancy.org/wp-content/uploads/2017/04/full-report-stemming-the.pdf>.

<sup>67</sup> <https://www.scmp.com/lifestyle/health/article/2168819/philippines-plastic-pollution-why-so-much-waste-ends-oceans>

management system due to improper dumping, informal dump sites and lack of proper controls (25%).<sup>68</sup>

The Philippines has implemented the Coastal and Marine Ecosystems Management Plan 2017–2028,<sup>69</sup> which includes plans to reduce threats to and degradation of coastal and marine ecosystems.

To tackle marine debris pollution, several cities in the Philippines have banned the use of single-use plastic bags, containers and straws.<sup>70</sup> Additionally, there are measures in place to promote plastic recycling, incentivise plastic segregation in schools and conduct clean-up activities in major polluted areas. The Philippines reportedly mounted the largest volunteer effort in the 2015 International Coastal Cleanup.<sup>71</sup>

The government has begun drafting the National Strategy on Marine Litter, which will provide the basis for the subsequent Master Plan on Marine Plastics Management.<sup>72</sup> The government is also working with NGOs to educate, create awareness and carry out marine conservation and monitoring activities.<sup>73</sup>

### 3.16 RUSSIA

In Russia, 81 percent of waste is transported to landfills, 13 percent disposed of in incineration plants and 6 percent processed in an industrial way or recycled. Russian waste management plants mostly include the purchase of industrial presses to compress trash for burial in a landfill, which very much depends on user charges or tariffs with limited opportunity for profit from selling recyclables, which limits further business interest. There are more than 240 waste processing factories with low-cost technology adoption and lack of environmental standards.<sup>74</sup>

According to a 2014 report by the Organisation for Economic Co-operation and Development (OECD), the key challenge for municipal solid waste management in Russia is the lack of collection and transportation services as well as accommodation (temporary storage) facilities, particularly in municipal areas and villages.<sup>75</sup> The market for solid domestic waste is limited and regulation is lax; there are only a few players and any number of firms can offer their service to any household.<sup>76</sup> There is also a lack of a separate waste collection or sorting process.<sup>77</sup> As separate waste collection or sorting is the first and most important step in waste

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<sup>68</sup> McKinsey & Company and Ocean Conservancy. ‘Stemming the Tide’.

<sup>69</sup> <https://www.bmb.gov.ph/cmemp>

<sup>70</sup> [http://www.congress.gov.ph/legisdocs/basic\\_17/HB08692.pdf](http://www.congress.gov.ph/legisdocs/basic_17/HB08692.pdf)

<sup>71</sup> Ocean Conservancy, ‘Together for Our Ocean: International Coastal Cleanup 2017 Report’ (Ocean Conservancy, 2017), [https://oceanconservancy.org/wp-content/uploads/2017/06/International-Coastal-Cleanup\\_2017-Report.pdf](https://oceanconservancy.org/wp-content/uploads/2017/06/International-Coastal-Cleanup_2017-Report.pdf).

<sup>72</sup> <https://www.worldbank.org/en/news/speech/2019/04/04/opening-remarks-by-agata-e-pawlowska-at-the-marine-plastics-conference-in-the-philippines>

<sup>73</sup> <https://www.marineconservationphilippines.org/about-marine-conservation-philippines/>

<sup>74</sup> These statistics are taken from <http://meridiandobra.ru/wp-content/uploads/2018/11/recycling-in-russia-eng.pdf>

<sup>75</sup> Organisation for Economic Co-operation and Development (OECD). ‘Policy Roundtables: Waste Management Services 2013’ (DAF/COMP(2013)26, OECD, 2014), 184, <http://www.oecd.org/daf/competition/Waste-management-services-2013.pdf>.

<sup>76</sup> OECD, ‘Policy Roundtables: Waste Management Services 2013’, 183.

<sup>77</sup> O. Fedotkina et al., ‘Circular Economy in Russia: Drivers and Barriers for Waste Management Development’, *Sustainability* 11, no. 20 (2019): 5837.

recycling and treatment, its absence results in slow development and competition for solid waste processing station facilities. A further challenge in the waste recycling sector is the size of financial investment needed, and the specific technologies and equipment necessary to comply with strict environmental emission requirements.

Based on secondary data, Russia faces the challenge of overflowing landfills due to increasing waste (municipal and imported) and a lack of recycling systems and infrastructure.<sup>72</sup> In order to reduce the amount of waste going into landfills, Russia has implemented an economy-wide solid waste management and recycling system including waste recycling facilities and collection bins for plastic and other wastes. As part of the project, Russia also aims to liquidate all unauthorised landfills in cities by 2024.<sup>78</sup> The government has pledged to build 220 waste processing plants across the economy by 2024 with 60 percent of Russia's solid household waste going into these plants.<sup>79</sup>

According to Vasilevskaia,<sup>80</sup> recent amendments give local governments in Russia the authority to collect, transport, process and dispose solid household waste while providing local citizens and NGOs with more influence in the development of infrastructure, and the location of waste collection points and recycling plants.<sup>81</sup> Russia has also implemented a law which adopts the Extended Producer Responsibility<sup>82</sup> principle wherein producers or importers of goods are responsible for the entire lifecycle of a product, that is, its collection after use, recycling and final disposal.<sup>83</sup>

Additionally, the Russian government is supporting policies that advance separate waste collection and waste recycling, promote the use of recycled materials, and prohibit mixed waste burial at landfills with less emphasis on landfilling and waste incineration.<sup>84</sup>

### 3.17 SINGAPORE

Singapore has a comprehensive waste management legal framework that encompasses solid waste collection, storage, transportation, treatment and disposal (incineration and landfill). The regulatory system aims to prevent and reduce marine debris pollution through the management of land-based marine debris, prevention of water pollution by ships, and management of water quality in inland waterbodies and coastal areas. International conventions such as MARPOL, the UN Convention on the Law of the Sea and the Basel Convention have been adopted by Singapore.

Singapore adopts a multipronged strategy which includes prevention, legislation, enforcement, monitoring and education to advance environmental management. This is achieved through a

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<sup>78</sup> <https://www.rvo.nl/sites/default/files/2018/09/waste-management-in-russia.pdf>

<sup>79</sup> <https://www.themoscowtimes.com/2018/12/12/how-russias-attempt-to-solve-its-trash-crisis-is-backfiring-a63795>

<sup>80</sup> D. Vasilevskaia, 'Marine Plastic Pollution: Can Law Help?' Legal Dialogue, 22 October 2018, <https://legal-dialogue.org/marine-plastic-pollution-can-law-help>.

<sup>81</sup> <https://legal-dialogue.org/marine-plastic-pollution-can-law-help>

<sup>82</sup> <http://www.ceerec.eu/node/71>

<sup>83</sup> International Finance Corporation (IFC), 'Waste in Russia: Garbage or Valuable Resource? Scenarios for Developing the Municipal Solid Waste Management Sector' (Moscow: IFC, 2014), <http://documents.worldbank.org/curated/pt/702251549554831489/pdf/Waste-in-Russia-Garbage-or-Valuable-Resource.pdf>

<sup>84</sup> Fedotkina et al., 'Circular Economy in Russia'.



comprehensive legal framework (policy and regulations), integrated public waste infrastructure and partnerships within people, public and private sectors.

The key preventive measure implemented by Singapore is strict regulations on waste management and disposal. An example is the anti-littering enforcement regime where offenders are served with heavy penalties and corrective work orders. Singapore also educates and encourages people and industries to practice the 3Rs. This is essential as Singapore has only one active landfill, and it is necessary to reduce the volume of waste going in. As such, Singapore's integrated waste management and collection system attempts to minimise waste at its source. All other incinerable wastes that are not segregated at their source for recycling are disposed of at waste-to-energy (WtE) plants for energy recovery. Modern flue gas treatments are also fitted at these plants to control the emissions.

As part of MARPOL obligations, the Maritime and Port Authority of Singapore (MPA) deploys garbage collection craft daily at scheduled times to collect garbage from ships at the anchorages. Further, inspections are conducted on both Singapore-registered ships and foreign-registered ships in Singapore's port to ensure that they comply with the regulations on garbage disposal and that anti-pollution measures are in place. Ships are also required to maintain garbage records and management plans for verification by inspectors. MPA's Port Inspectors also patrol Singapore's port waters to ensure that ships in the Port of Singapore do not illegally discharge waste, oil, garbage and sewage.

Managing plastic and packaging waste is one of the key priorities for Singapore. Starting with upstream reduction, the government, industry and NGOs jointly launched the Singapore Packaging Agreement to reduce packaging waste. Singapore will be introducing mandatory reporting of packaging data, including plastics, and 3R plans for packaging in 2020. This also builds on an existing mandatory waste reporting framework for large shopping malls and hotels, which will be expanded to all large industrial and commercial premises by 2020. The mandatory packaging reporting framework will also lay the foundation for an Extended Producer Responsibility framework which ensures producers are responsible for the collection and recycling of the packaging materials for their products and for managing packaging waste (including plastics).

Singapore also supports ground-up initiatives on reducing packaging use through funding support. One such initiative was a campaign which aimed to encourage consumers to use reusable bags and containers when they take away food, beverages and groceries. To encourage residents to recycle, all residential premises have convenient access to recycling services, including the collection of plastic recyclables, through the National Recycling Programme. Recyclables including plastics are collected through a commingled system, then sorted, baled and sent for recycling.

Singapore's approach has been to reduce the excessive use of all types of disposables (not only single-use plastics), as all of these disposables have an environmental impact; and to promote the use of reusable materials. Singapore does not target plastics alone, as this may simply result in their substitution by other types of materials which could be more harmful to the environment.

The key remedial measures for marine debris are focused on coastal and inland water bodies and submarine clean-up exercises. Waterway clean-ups are conducted through routine cleaning regimes in all inland waterways. Litter traps and float booms have also been installed where

appropriate as part of the drainage network to trap debris and litter from flowing out into the sea.

There are marine debris monitoring programmes established in Singapore that aim to gather information on marine debris washed onto Singapore's shores and their trends. The data will help to inform management approaches and policies.

Singapore is developing the local recycling industry to better extract resources from waste and close the waste loop domestically. The National Environment Agency (NEA) is currently studying recycling solutions and technologies and assessing their suitability for adoption in Singapore. For example, mechanical recycling to turn waste plastics into plastic pellets for manufacturing new products, or chemical recycling to turn plastic waste into chemical feedstock or fuel are being considered.

### **3.18 CHINESE TAIPEI**

Chinese Taipei has laws regulating the collection, storage, transportation, treatment and disposal of wastes. Policies related to marine debris aim to prohibit discharge of litter at harbour areas, regulate waste discharge at port reception facilities, maintain the marine ecology, safeguard public health and sustainably use marine resources.

Along with NGOs, the government has established a Marine Debris Governance Platform to develop an action plan for reduction of marine debris pollution. The platform focuses on social collaboration, participation, research, source reduction, waste prevention and removal.

The main source of land-based marine debris in Chinese Taipei is tourism and coastal recreation activities while sea-based marine debris arises from port activities.

The key preventive measure established by Chinese Taipei is the promotion of public awareness on marine pollution (environmental education). Chinese Taipei subsidises local governments to set up recycling stations in villages and harbours to promote plastic recycling. Subsidies are also provided for transportation of garbage from remote islands. Moreover, inspections of landfill sites near to the river (less than 1 kilometre) are conducted to prevent trash overflow.

Chinese Taipei has been recognised for its strong progress in recycling efforts. Starting with a 70 percent trash collection rate, nearly full landfills and non-existent waste recycling in the 1990s, Chinese Taipei has managed to reduce waste to 850 grams daily per person and reach an over 50 percent recycling rate; and its incinerators running below capacity. This progress has been achieved through an efficient waste management framework comprising of citizens and manufacturers, and behaviour-changing initiatives like providing disincentives for generating trash.

To mitigate marine debris at its source, there are bans and restrictions on the use of certain plastic materials such as microbeads in cosmetic and personal care products; straws; and single-use plastics (including those for packaging) in various commercial areas.

As part of Chinese Taipei's Marine Debris Governance Platform, the remedial actions include targeted marine debris clean-ups on the sea surface and the seabed at certain hotspots including

coastlines, rivers and irrigation channels. Funding is provided to local governments to conduct these clean-ups. Moreover, fishers are encouraged to set up Environmental Protection Fleets for retrieving floating marine debris, and ensuring its proper disposal during sightseeing, leisure and fishing activities. Volunteers with scuba diving skills are also encouraged to assist in safe underwater waste removal.

Chinese Taipei conducted various research on marine debris including marine debris monitoring, microplastics pollution and its impact to biodiversity. Surveys have also been conducted to understand the use of disposable plastics in the economy. Various methodologies are deployed to monitor marine debris including visual surveys, satellite telemetry and unmanned aerial vehicle. Chinese Taipei's Ocean Conservation Administration focuses on monitoring and removing marine debris from the sea floor.

### 3.19 THAILAND

Most of the marine debris in Thailand originates from both inland plastic waste and solid waste that is dumped directly into the ocean. In 2018, 7.15 million tons of solid waste were disposed of inappropriately, for example, through open dumping or open burning in waste disposal sites, illegal dumping in public areas and throwing into water bodies. Solid wastes that are disposed of inappropriately through open dumping or illegal dumping may result in the contamination of inland wastes into the sea; i.e., leachate from solid waste landfills (Kindt, 1985). Most municipal solid waste facilities are operated by the government and impose limits on dumps with a capacity of less than 50 tons per day<sup>85</sup>. All incinerators for energy production are operated by the private sector (six sites), whereas there are 16 public incinerators with air pollution control systems.<sup>86</sup> To improve waste and pollution management, Thailand established the 20-Year Pollution Management Strategy, the Pollution Management Plan 2017–2021 and the Master Plan on Waste Management 2016–2021.<sup>87</sup>

As part of the Plastic Waste Management Road Map 2018–2030,<sup>88</sup> Thailand has committed to reducing at least 50 percent of marine plastic and ensuring that 100 percent of plastic waste is reusable by 2027.<sup>89</sup> To achieve this goal, Thailand established the Thailand Public Private Partnership for Plastic and Waste Management<sup>90</sup> (PPP Plastic) strategy to reduce plastic waste and marine debris through stakeholder engagement, promotion of education and behavioural change, and improvements in waste segregation and the management system for plastic recycling.<sup>91</sup> With this roadmap, Thailand announced the progressive elimination of various plastics including microbeads, cap seals and oxo-degradable plastics and other types of single-use plastics<sup>92</sup>.

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<sup>85</sup> Kamuang, T. and O. Siriratpiriya. 'State of the 3Rs in Asia and the Pacific: Country Chapter – Kingdom of Thailand'. Nagoya: UNCRD, 2017.

<http://www.uncrd.or.jp/content/documents/5695%5bNov%202017%5d%20Thailand.pdf>.

<sup>86</sup> These statistics are taken from *Booklet on Thailand State of Pollution 2018*.

<sup>87</sup> <https://oceanconference.un.org/commitments/?id=18208>

<sup>88</sup> [https://thailand.prd.go.th/1700/ewt/thailand/ewt\\_news.php?nid=7831&filename=index](https://thailand.prd.go.th/1700/ewt/thailand/ewt_news.php?nid=7831&filename=index)

<sup>89</sup> [https://endplasticwaste.org/latest/the-alliance-launches-in-thailand-and-southeast-asia-where-the-need-is-greatest/#\\_ftn1](https://endplasticwaste.org/latest/the-alliance-launches-in-thailand-and-southeast-asia-where-the-need-is-greatest/#_ftn1)

<sup>90</sup> <https://www.thephuketnews.com/thailand-pledges-to-cut-sea-debris-by-50-70602.php?#3wTSBbPFcrju0fIo.97>

<sup>91</sup> <https://gccircularliving.pttgcgroup.com/storage/symposium/speakers/presentation/pranee-poopair-thailand-public-private-partnership-for-plastic.pdf.pdf>

<sup>92</sup> <https://thaiembdc.org/2019/04/29/thailand-will-ban-three-plastics-this-year/>

Thailand is embracing the 3R concept by introducing returnable plastic crate trays in supermarkets to be cleaned and re-used and it is experimenting with selling carbonated beverages in glass bottles which will be returned for reuse using a deposit system.<sup>93</sup> It is also encouraging the use of innovative materials to reduce waste, for example, using cassava roots to make boxes, trays and cups.<sup>94</sup> Municipal solid waste to energy plants in Thailand are successful in reducing the amount of waste and also improving the quality of waste created in order to meet pollution control standards.<sup>95</sup> Policy specific to marine debris management in 2018 includes reducing or preventing the amount of solid waste being thrown into the sea by certain target groups such as commercial and local fishing boats, coastal communities and tourism companies and tourists.<sup>96</sup>

Thailand established a plastic material flow database<sup>97</sup> to collect plastic production, consumption and waste management data to provide a better understanding of the lifecycle of plastics and to advance effective solutions for the issues identified.<sup>98</sup>

Thailand is also part of a global initiative to clean-up oceans. Upcycling the Oceans<sup>99</sup> is an effort that encourages local fishers to take part in removing plastic from the surrounding marine environment. The plastic collected is then recycled into thread to make environment-friendly products.

### 3.20 UNITED STATES

The United States has a comprehensive legislative framework for waste management that covers the collection, storage, transportation, treatment and disposal of solid wastes. It is a party to several international conventions to minimise marine pollution including MARPOL, the London Convention and the Land-Based Sources Protocol to the Cartagena Convention.

The key preventive measure for the United States is the Marine Debris Act, which requires the National Oceanic and Atmospheric Administration (NOAA) Marine Debris Program to investigate and prevent the adverse impact of marine debris through five main pillars: prevention, research, removal, regional coordination and emergency response. The Marine Debris Program supports outreach and education initiatives that create awareness and change behaviour to prevent marine debris pollution. It also supports community-based projects to clean-up marine debris from local shorelines and remove vessels.

In terms of research, the Marine Debris Program monitors marine debris quantities and types on shorelines and supports projects to understand marine debris baselines, chemicals in plastics, debris detection, plastic ingestion by wildlife, economic implications, and ways to minimise the impact of derelict fishing gear. The Marine Debris Program supports local marine debris initiatives through coordination among 10 regions within the United States. Its staff in

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<sup>93</sup> <https://thaiembdc.org/2018/11/12/thailand-reducing-plastic-waste-with-innovative-materials/>

<sup>94</sup> Ibid.

<sup>95</sup> S. Boonpa and A. Sharp, 'Waste-to-energy Policy in Thailand', *Energy Sources, Part B: Economics, Planning, and Policy* 12, no. 5 (2017): 434–42, doi: 10.1080/15567249.2016.1176088

<sup>96</sup> Booklet on Thailand State of Pollution 2018.

<sup>97</sup> <https://www.thepuketnews.com/thailand-pledges-to-cut-sea-debris-by-50-70602.php#iFb0LjqDBEhVuPwQ.97>

<sup>98</sup> [https://www.researchgate.net/publication/313283083\\_Material\\_flows\\_analysis\\_of\\_plastic\\_in\\_Thailand](https://www.researchgate.net/publication/313283083_Material_flows_analysis_of_plastic_in_Thailand)

<sup>99</sup> <https://ecoalf.com/en/p/upcycling-the-oceans-15>

each region guide action planning and provide expertise to ensure that stakeholders have the best information available. Finally, the Marine Debris Program supports regionally focused emergency response planning efforts and coordinates with partners during an acute marine debris event.

The United States Environmental Protection Agency (USEPA) has developed the Sustainable Materials Management (SMM) approach, which utilises and reuses materials efficiently over their entire lifecycle. The USEPA also focuses on managing waste through source reduction, reuse, recycle, composting and energy recovery. To prevent marine debris pollution, the USEPA has also implemented the Trash Free Waters Program across the economy and internationally. Trash Free Waters works with stakeholders locally and at the city, state and regional levels to identify problems and prioritise low-tech, low-cost solutions to prevent and reduce marine litter and debris. These projects range in scale from removing tires in a local waterway to installing storm capture devices in storm drains in an urban area. The measures aim to prevent and reduce marine litter and debris in waterways, where trash can ultimately end up in the oceans.

NOAA provides grant funding through a competitive programme for local-level activities within the United States to prevent the introduction of marine debris into the marine and coastal environment. Projects awarded through this grant competition actively engage and educate a target audience in hands-on programmes designed to raise awareness, reduce barriers to marine debris prevention (e.g., lack of access to waste receptacles or alternatives to single-use items), and encourage and support changes in behaviour to ensure long-term prevention of marine debris.

Currently, NOAA's research programme is focused on three areas: understanding the fate and transport of debris (movement in the coastal and marine environments), impacts of debris on species, and impacts on coastal and marine habitats.

The main remedial measure is the marine debris removal programme funded by NOAA. It has developed a Fishing for Energy Partnership with the private sector and industries to minimise the impacts of derelict fishing gear. The programme provides the fishing community no-cost options for disposing of old or unwanted gear; and the old nets, line and ropes are converted into energy. NOAA is also prepared for emergency responses to map and survey marine debris following natural disasters (e.g., hurricanes).

NOAA has established a Marine Debris Monitoring and Assessment Project, which compiles marine debris quantities and type in the marine environment. With regular marine debris monitoring, the effectiveness of existing marine debris prevention initiatives can be assessed and inform targets of future mitigation efforts.

### **3.21 VIET NAM**

Municipal solid waste in Viet Nam is managed by the provincial and municipal governments.<sup>100</sup> Collection and transportation services for municipal solid waste are available in urban areas but may be limited in rural areas. The majority of municipal solid waste from urban areas end up in landfills while those from rural areas are burnt or incinerated by the

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<sup>100</sup> [https://www.theseus.fi/bitstream/handle/10024/147214/Truong\\_Ngan.pdf?sequence=1&isAllowed=y](https://www.theseus.fi/bitstream/handle/10024/147214/Truong_Ngan.pdf?sequence=1&isAllowed=y)

locals. According to Thang (2019), the current waste management framework in Viet Nam includes open dumps or tips into landfills, incineration, waste to energy, and recycling; however, all plastics may not be recyclable or recycled due to insufficient waste streams. Viet Nam has developed a plastic waste collecting system to help reduce the dumping of solid wastes into the marine environment.

The National Strategy on Integrated Management of Solid Waste was recently revised to include stricter control over hazardous waste; the collection and treatment of solid waste generated in rural areas; and the use of only 100 percent eco-friendly plastic bags in supermarkets and trade centres.<sup>101</sup>

Viet Nam has adopted preventive measures from international conventions including the Basel Convention and MARPOL by, for example, requiring ships to have adequate oil filtration systems.<sup>102</sup>

Viet Nam is developing a National Action Plan to address the marine debris issue.<sup>103</sup> It will implement policies and measures to reduce 50 percent of marine debris by 2025 and clean up 50 percent of lost or broken fishing equipment.<sup>104</sup> The plan will focus on promoting reuse of plastic products, enhancing recycling efforts and building a circular economy. Some measures considered include collecting lost or broken fishing equipment and restriction on single-use plastic bags at tourism sites and coastal service facilities.

As a remedial action, Viet Nam has initiated shoreline clean-up operations in coastal areas and organised public awareness campaigns to inform residents and tourists on marine debris prevention.<sup>105</sup> There is a Viet Nam Environment Protection Fund<sup>106</sup> that provides financial resources for hosting environmental events, developing clean energy and collecting data, among others. The government has plans to establish a National Natural Resources and Environment Monitoring Database using advanced technology in order to help in policymaking.<sup>107</sup> The impact of microplastics on human health is a topic being considered for future research.

Specific challenges for marine debris regulation concern the lack of practical experience and specific regulations and guidelines on management, and issues with the collection and handling of plastic waste. Currently, plastic bags are still used and disposed widely by the community. Infrastructure facilities for classification, recycling, reuse and waste treatment are lacking. It is important for manufacturing companies to put more effort into environmental protection and technical requirements to produce environmentally friendly goods.<sup>108</sup> Better data collection efforts will also help in identifying and mapping hot spots with marine debris and plastic waste.

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<sup>101</sup> <http://vea.gov.vn/en/laws/LegalDocument/Pages/Revision-of-the-National-strategy-on-integrated-management-of-solid-waste.aspx>

<sup>102</sup> <https://pdfs.semanticscholar.org/f3ca/e889d57c8b1b5cddb02eccbc601204ce470a.pdf>

<sup>103</sup> <https://english.vov.vn/society/action-plan-for-marine-debris-reduction-to-be-built-401352.vov>

<sup>104</sup> <https://pdfs.semanticscholar.org/f3ca/e889d57c8b1b5cddb02eccbc601204ce470a.pdf>

<sup>105</sup> <https://english.vov.vn/society/ocean-cleanup-campaign-launched-in-28-coastal-locales-across-vietnam-379058.vov>

<sup>106</sup> <https://www.vepf.vn/>

<sup>107</sup> <https://www.vepf.vn/news/environmental-news/vietnam-to-develop-natural-resources-environment-monitoring-database-766.html>

<sup>108</sup> [https://www.fig.net/resources/proceedings/fig\\_proceedings/fig2019/papers/ts01d/TS01D\\_le\\_dai\\_10174.pdf](https://www.fig.net/resources/proceedings/fig_proceedings/fig2019/papers/ts01d/TS01D_le_dai_10174.pdf)

## 4. MEASURES TAKEN IN OTHER ECONOMIES

### 4.1 EUROPEAN UNION

The European Union (EU) established the Marine Strategy Framework Directive<sup>109</sup> in 2008 to ensure that their members' marine waters are maintained in 'good environmental status' by 2020. Eleven qualitative descriptors of the marine environment were provided, of which Descriptor 10 was related to marine litter. This legislation was specifically designed to protect the marine environment and the natural resources and to create a framework for the sustainable use of marine waters. As part of the legislation, EU members have to ensure that specific marine debris targets are met by 2020.

The European Strategy for Plastics in a Circular Economy<sup>110</sup> was also passed to initiate transformation in plastic designs, production, usage and recycling in the EU. The key measures identified to create an innovative and sustainable plastic industry include the following:

- **Improving the economics and quality of plastics recycling:** Plastics should be designed to ensure that they can be easily reused or recycled. Plastic packaging should be a priority area for recyclability design as the EU is committed toward making all plastic packaging in the market reusable or easily recycled by 2030. This can be achieved through the Extended Producer Responsibility strategy which will provide incentives to reward sustainable designs. The EU also requires products to meet the recyclability and the Eco-design Directive. This will enable easier recycling of plastic components in electrical appliances and electronics.

In order to drive demand for recycled plastics, the EU will standardise quality standards for sorted or recycled plastic waste. Collaboration with the chemical sector, for example, is required to ensure plastics can be recycled to higher quality standards for food applications. The EU will also provide funding for research on identifying contaminants in plastics and decontamination of plastics through Horizon 2020.

To support the integration of recycled plastics in EU markets, the EU will explore and target sectors (e.g., automotive or construction) which may use recycled content in their applications. The EU will also consider rewarding the packaging sector for use of recycled content and integrating recycling content into the Green Public Procurement criteria.

- **Curbing plastic waste and littering:** The EU has stipulated legislation to reduce consumption of plastic bags and their contribution toward marine debris. The EU legislation on enhancing waste collection systems is essential to prevent littering which may lead to marine debris. The EU will promote easy access to tap water which will also reduce the need for bottled water.

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<sup>109</sup> [https://ec.europa.eu/environment/marine/eu-coast-and-marine-policy/marine-strategy-framework-directive/index\\_en.htm](https://ec.europa.eu/environment/marine/eu-coast-and-marine-policy/marine-strategy-framework-directive/index_en.htm)

<sup>110</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1516265440535&uri=COM:2018:28:FIN>

The EU has encouraged the design of biodegradable and compostable plastics but noted that these plastics only degrade under specific conditions. Efforts to label biodegradable or compostable plastics will be carried out by the EU to educate the public on the conditions of its use. The use of oxo-degradable plastics will be restricted since they have similar environmental impacts to conventional plastic.

The EU has considered banning products that have intentionally added microplastics. It will also identify new ways to prevent microplastics pollution by capturing microplastics from wastewater treatment plants and synthetic textile industries. Microplastics in drinking water will also be tested to assess their health impacts.

The EU provides funding for anti-littering awareness campaigns and initiatives such as beach clean-ups. To prevent sea-based marine debris, the EU will develop a strategy to manage waste from ships, and measures for reducing abandoned fishing gears and marine litter from aquaculture. Furthermore, the introduction of Enhanced Producer Responsibility in targeted areas will reduce littering and promote recycling.

- **Driving innovation and investment toward circular solutions:** This strategy requires large investments in infrastructure and innovation to drive transformation in the plastics value chain. For example, digital watermarking of plastics will allow easier sorting and traceability of plastics. Innovations are essential especially for materials that can biodegrade in fresh or seawater. The EU is considering using alternative bio-based feedstocks (i.e., biomass) to produce plastics and to conduct lifecycle analysis to assess its impact.

A large amount of funds have been allocated by the EU to plastic-related innovation priorities. A Strategic Research and Innovation Agenda on plastics will be established to provide guidance for funding of research and innovation beyond 2020. Besides innovative projects, the EU will also invest in modern, scaled up, and economically viable recycling plants.

Enhanced Producer Responsibility schemes will be well-designed to provide financing for plastic collection and treatment costs. They could also provide incentives for businesses that develop sustainable plastic products. Benefits of Enhanced Producer Responsibility include improving recycling efficiency, promoting product design for recycling, reducing litter, and encouraging better conversation among local governments, manufacturers and recyclers.

- **Harnessing global action:** As marine debris is a transboundary issue, international cooperation is crucial in tackling the problem. The EU supports several international initiatives that take action to combat marine debris (from the G7, G20, the United Nations, MARPOL and the Regional Sea Conventions). The EU also participates



actively in the United Nations Environment Assembly working group on international responses to fight against marine debris and microplastics. The EU is planning to launch a project to reduce marine debris in Southeast Asia, where marine debris is a growing concern.

With the world's highest plastic recycling rates, the EU is positioned to lead the development of the plastic circular industry worldwide, sharing modern recycling technologies and solutions to prevent marine debris. The EU is also considering developing international standards to enhance industry confidence in recycled plastics.

## 4.2 NORWAY

Norway has also set combatting marine debris as a high priority in its agenda. Apart from proper waste management and anti-littering, Norway has implemented other legislation for marine debris prevention.

A key preventive measure for marine debris is the implementation of the Producer Responsibility Scheme. This has helped Norway achieve the highest recycling rate, at 97 percent, for plastic drinking bottles. Producer responsibility for beverage packaging requires the producer to cover costs for collection, treatment and prevention of packaging waste. Consumers are required to purchase the beverage with a 'deposit' at point of sale and claim a cash refund when the packaging is returned. As a result, reverse vending machines can be found in every grocery store in Norway. This system ensures a high return rate of plastic bottles by charging lower taxes for bottles and cans depending on their return percentages.<sup>111</sup>

Norway is also considering the implementation of this Producer Responsibility Scheme for plastic products used by the aquaculture and fisheries industries, which implies that the producers of fishing nets will be responsible for the disposal of their fishing nets as well as their clean-up if they contribute to marine debris.<sup>112</sup>

Norway has also launched the Norwegian Development Program to combat marine litter and microplastics.<sup>113</sup> The main objective of the programme is to prevent and reduce marine debris pollution in developing economies. An example is the funding commitment through the PROBLUE fund which aims to improve waste management systems in developing economies with inadequate infrastructure.

Norway has a Fishing for Litter initiative where fishing vessels collect marine debris during fishing operations and return them to port facilities for disposal or recycling for free. The initiative contributes to marine debris clean-up efforts and provides information on quantities and types of marine debris.

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<sup>111</sup> <https://www.regjeringen.no/en/aktuelt/brussels-speech-on-marine-litter/id2607330/>

<sup>112</sup> <https://www.regjeringen.no/en/aktuelt/brussels-speech-on-marine-litter/id2607330/>

<sup>113</sup> [https://www.regjeringen.no/en/dokumenter/marine\\_litter/id2642037/](https://www.regjeringen.no/en/dokumenter/marine_litter/id2642037/)

## 5. SUMMARY OF MEASURES IN APEC ECONOMIES

### 5.1 SURVEY FINDINGS

Based on the survey responses and secondary data, most APEC economies have implemented a range of measures, both through regulatory and non-regulatory instruments, to manage the marine debris issue. A summary of the survey responses and secondary research for each APEC economy is provided in Table 5.1. A brief overview of the measures in APEC economies by category is also provided:

#### **Laws and regulations**

- General management of domestic and industrial waste has been established in most economies. These regulations include proper waste management, anti-littering, prevention of dumping of waste on land (especially beaches) and/or at sea from any ships and vessels.
- Laws specific to the management of plastic waste and recycling are not adopted by many economies.
- Measures regarding marine debris or plastics waste management from international conventions have been incorporated into legislation by many economies.

#### **Enforcement**

- With legislation in place, several economies implemented enforcement regimes that are essential to preventing marine debris pollution. Enforcement is targeted against the source of pollution including industries such as fisheries, aquaculture and even landfill sites near rivers.

#### **Policies**

- Many economies implemented economy-wide policies to prevent marine debris pollution through the 3Rs and reduction of plastic usage.
- Restriction or ban of certain plastic items (i.e., single-use plastics, straws and microbeads).
- Only one economy, Peru, has highlighted that offshore submarine emissaries, in this case, for fishery plants are required to submit environmental impact studies and plans to prevent waste pollution.

#### **Initiatives**

- Several economies have developed initiatives to increase public awareness of marine debris issues through education. These public campaigns can be led by the government or in collaboration with NGOs.
- Many economies have developed waste management services or infrastructure at strategic locations such as harbour, port or village areas, and provide transportation of waste from remote islands to the mainland for disposal and treatment.

#### **Collaboration and partnerships**

- Many economies encourage collaboration and partnerships between the public and private sectors to promote innovation in alternative plastic, clean-up and education campaigns.

#### **Financial support**

- Most economies provide funding for academia to conduct research on marine debris including monitoring and clean-up. In some cases, subsidies are provided to local governments to set up waste management infrastructure (recycling stations).

### **Research**

- Research conducted by most economies is focused on the impact of marine debris, typically microplastics, its distribution, its impact on biodiversity and health, as well as monitoring methods.

### **Remedial measures**

- Many economies conduct beach clean-up activities as a remedial measure, and some clean up marine debris floating on sea or even those on the seabed (underwater). These clean-up activities are targeted at polluted areas and require collaboration between local governments, voluntary groups and public institutions.

### **Marine debris monitoring**

- Monitoring methods adopted by economies are limited to manual counting during beach clean-ups. Only Chinese Taipei monitors marine debris using satellite telemetry and unmanned aerial vehicles.

**Table 5.1. Summary of preventive measures from APEC economies**

APEC Economy	Preventive and Remedial Measure	
	Topic	Description
Australia	Regulatory Framework and Policies	<ul style="list-style-type: none"> <li>• Marine debris listed as a key threatening process to marine life under the Environment Protection and Biodiversity Conservation Act; Threat Abatement Plan developed to provide guidance on actions to prevent marine debris pollution.</li> <li>• Established National Waste Policy (mitigating marine debris at source, waste reduction, recycling, Extended Producer Responsibility)</li> <li>• Implemented Australian Packaging Covenant, an economy-wide instrument to reduce packaging waste</li> <li>• Banned single-use plastics</li> </ul>
	Initiatives	<ul style="list-style-type: none"> <li>• Voluntary phasing out of microbeads from personal care and cosmetic products</li> <li>• Implement container deposit schemes</li> </ul>
	Remedial Actions	<ul style="list-style-type: none"> <li>• Regular beach and waterway clean-ups (including in remote and polluted areas)</li> </ul>
Brunei Darussalam	Regulatory Framework	<ul style="list-style-type: none"> <li>• Restrict use of plastic bags</li> </ul>
	Initiatives	<ul style="list-style-type: none"> <li>• Awareness campaigns, including ‘No Plastic Bag Everyday’, anti-littering, reducing disposable and styrofoam products.</li> </ul>
Canada	Regulatory Framework and Policies	<ul style="list-style-type: none"> <li>• Established proper waste management system – collection, storage, transportation, treatment (incineration, recycling or composting), disposal (landfill)</li> <li>• Introduced regulations to prevent waste discharge from ships and prohibit dumping of plastic waste at sea</li> <li>• Banned microbeads in toiletries</li> <li>• Adopted a Canada-wide Action Plan for Extended Producer Responsibility</li> <li>• Implemented Strategy for Sustainable Packaging</li> <li>• Introduced economy-wide Strategy on Zero Plastic Waste</li> </ul>
	Collaboration	<ul style="list-style-type: none"> <li>• Championed the Ocean Plastics Charter, which brings together government, business and civil organisations to work on eliminating plastic pollution and improving the management of plastics across their lifecycle</li> <li>• Central and local governments are working collaboratively with Indigenous communities, industry, NGOs, academia and others to implement the Canada-wide Strategy on Zero Plastic Waste</li> </ul>
	Funding	<ul style="list-style-type: none"> <li>• Support innovative technologies in areas such as food packaging, construction waste, marine vessels and fishing gear removal to reduce waste</li> <li>• Provide funding for education and awareness-raising projects, clean-up activities, community projects, and research on marine debris or plastic</li> </ul>

APEC Economy	Preventive and Remedial Measure	
	Topic	Description
	Remedial Actions	<ul style="list-style-type: none"> <li>• Conduct shoreline clean-ups and fishing gear removal activities</li> </ul>
Chile	Regulatory Framework and Policies	<ul style="list-style-type: none"> <li>• Established proper waste management system – collection, transportation, treatment (recycling), disposal (landfill)</li> <li>• Prohibit dumping of waste on beaches (land-based)</li> <li>• Prevent illegal dumping from ships and aquaculture facilities at ports, rivers and lakes (sea-based)</li> <li>• Ban plastic bags in coastal areas</li> </ul>
	Enforcement	<ul style="list-style-type: none"> <li>• Strengthen enforcement of MARPOL Annex V (e.g., ensure proper marking and disposal of fishing gear)</li> </ul>
	Initiatives	<ul style="list-style-type: none"> <li>• Provide adequate waste reception facilities onshore</li> <li>• Developed voluntary programmes to reduce plastic packaging onboard shipping vessels</li> <li>• Increase awareness of marine debris pollution within the aquaculture, fishery and shipping industries</li> <li>• Collaborate with NGOs and private organisations to organise (government-led) educational campaigns</li> </ul>
	Remedial actions	<ul style="list-style-type: none"> <li>• Conduct beach clean-up activities</li> </ul>
	Monitoring	<ul style="list-style-type: none"> <li>• Identify and map marine debris along Chile’s coastline</li> <li>• Promote collaboration between private, public and academia for monitoring and collection of marine debris</li> </ul>
China	Regulatory Framework and Policies	<ul style="list-style-type: none"> <li>• Established proper waste management system – sorting, collection, storage, transportation, treatment (incineration, recovery or recycling), disposal (landfill)</li> <li>• Regulate construction waste management (environmental impact assessment with preventive and mitigation measures and monitoring plan)</li> <li>• Prohibit dumping of waste on beaches and into the ocean</li> <li>• Provide waste storage facilities at ports</li> <li>• Ban disposable plastic bags</li> <li>• Mandatory domestic solid waste classification and treatment system</li> <li>• Regulate the recovery and disposal of waste electrical product</li> </ul>
	Enforcement	<ul style="list-style-type: none"> <li>• Prevent illegal dumping of waste into waterways</li> </ul>
	Funding	<ul style="list-style-type: none"> <li>• Enhance solid waste management technology</li> <li>• Research on biodegradable packaging</li> <li>• Local and provincial governments to control marine pollution</li> </ul>
	Collaboration	<ul style="list-style-type: none"> <li>• Increase recycling through collaboration between garbage recycler, consumer and local governments</li> </ul>
	Remedial actions	<ul style="list-style-type: none"> <li>• Beach, submarine and sea surface trawl in polluted areas</li> </ul>

APEC Economy	Preventive and Remedial Measure	
	Topic	Description
Hong Kong, China	Regulatory Framework and Policies	<ul style="list-style-type: none"> <li>• Introduced Plastic Shopping Bag Charging</li> <li>• Implemented Producer Responsibility Scheme on waste electrical and electronic equipment and glass beverage containers progressively</li> <li>• Levied charges on municipal solid waste generation</li> </ul>
	Research	<ul style="list-style-type: none"> <li>• Consultancy study on personal care and cosmetic products containing microbeads commenced in 2018 to increase understanding of the latest international developments in the control practices related to such products, to solicit local stakeholders' views on control regimes and make recommendations on control strategies</li> </ul>
	Initiatives	<ul style="list-style-type: none"> <li>• Increase public awareness to keep shorelines clean</li> </ul>
	Funding	<ul style="list-style-type: none"> <li>• Provide financial support for upgrading recycling infrastructure</li> </ul>
Indonesia	Regulatory Framework and Policies	<ul style="list-style-type: none"> <li>• Established National Action Plan on Marine Debris</li> <li>• Established Integrated Waste Management Facility for Reduce-Reuse-Recycle (TPST 3R)</li> </ul>
	Collaboration	<ul style="list-style-type: none"> <li>• Collaborate with Global Plastic Action Partnership to reduce overpackaging, invent recyclable plastic and increase recycling rates</li> </ul>
	Research	<ul style="list-style-type: none"> <li>• Investigate the use of emerging technologies in combating marine debris</li> </ul>
	Monitoring	<ul style="list-style-type: none"> <li>• Monitoring conducted by NGO in collaboration with government agencies</li> </ul>
Japan	Regulatory Framework and Policies	<ul style="list-style-type: none"> <li>• Established proper waste management system – collection, storage, transportation, treatment (sorting, recycling, crushing, incineration or composting), disposal (landfill)</li> <li>• Prevent dumping of waste on beaches (land-based)</li> <li>• Prevent dumping of waste from ships or any offshore facilities into ocean</li> <li>• Stipulate remedial actions and provide funding to clean up marine debris and develop a monitoring plan</li> </ul>
	Partnership	<ul style="list-style-type: none"> <li>• Promote multistakeholder partnerships locally and internationally (i.e., support innovation in alternative plastic and economy-wide clean-up campaign)</li> </ul>
	Collaboration	<ul style="list-style-type: none"> <li>• International cooperation for promoting measures in developing economies</li> </ul>
	Research	<ul style="list-style-type: none"> <li>• Distribution of marine plastic locally and globally</li> <li>• Impact of marine plastic</li> <li>• Improvement of marine plastic measuring method</li> </ul>
	Remedial Actions	<ul style="list-style-type: none"> <li>• Promote clean-up activities</li> </ul>
	Monitoring	<ul style="list-style-type: none"> <li>• Marine debris monitoring implemented as part of law</li> <li>• Monitor beach, floating and seabed debris</li> </ul>

APEC Economy	Preventive and Remedial Measure	
	Topic	Description
		<ul style="list-style-type: none"> <li>Local governments investigate the cause of marine debris and promote effective policies to control marine debris generation</li> </ul>
Korea	Regulatory Framework and Policies	<ul style="list-style-type: none"> <li>Established proper waste management system – collection, storage, transportation, treatment (recycling, incineration and waste-to-energy), disposal (landfill)</li> <li>Prevent discharge of waste from ships into the ocean</li> <li>Restrict use and sale of plastic packaging</li> <li>Improve plastic waste collection from ships</li> <li>Strengthen waste management system</li> <li>Expedite processing and recycling of marine plastic</li> </ul>
	Initiatives	<ul style="list-style-type: none"> <li>Increase public awareness of marine debris</li> <li>Awareness-raising for fishers (marine debris originates from fishing activities)</li> </ul>
	Remedial actions	<ul style="list-style-type: none"> <li>Beach and ocean surface clean-up</li> <li>Involve local government, voluntary groups and public institutions</li> <li>Compensate for voluntary collection of discarded fishing gears</li> </ul>
	Funding	<ul style="list-style-type: none"> <li>Developed marine waste treatment project and surveys on microplastic pollution</li> </ul>
Malaysia	Regulatory Framework and Policies	<ul style="list-style-type: none"> <li>Established action plans toward zero single-use plastics</li> <li>Pollution charges for single-use plastics</li> </ul>
	Initiatives	<ul style="list-style-type: none"> <li>Create circular economy for single-use plastics</li> <li>Incentivise eco-friendly alternatives</li> <li>Education and public awareness initiatives</li> </ul>
	Funding	<ul style="list-style-type: none"> <li>Green technology funding schemes to promote growth of green economy</li> </ul>
	Research	<ul style="list-style-type: none"> <li>Research on plastic alternatives</li> </ul>
Mexico	Regulatory Framework and Policies	<ul style="list-style-type: none"> <li>Banned single-use plastics</li> </ul>
	Education	<ul style="list-style-type: none"> <li>Biweekly publications informing people on a number of marine issues</li> </ul>
New Zealand	Regulatory Framework and Policies	<ul style="list-style-type: none"> <li>Established proper waste management system – collection, storage, transportation, treatment (recycling), disposal (landfill)</li> <li>Prevent discharge of waste from ships or offshore facilities into the ocean</li> </ul>

APEC Economy	Preventive and Remedial Measure	
	Topic	Description
		<ul style="list-style-type: none"> <li>Banned single-use plastic shopping bags</li> <li>Banned wash-off products containing plastic microbeads</li> </ul>
	Funding	<ul style="list-style-type: none"> <li>Established waste minimisation fund from levy on waste disposed in landfill to support innovation in addressing marine debris issues</li> </ul>
	Enforcement	<ul style="list-style-type: none"> <li>Illegal discharge into waterways</li> </ul>
	Infrastructure	<ul style="list-style-type: none"> <li>Developed material recovery and local reprocessing facilities</li> </ul>
	Initiatives	<ul style="list-style-type: none"> <li>Extended Producer Responsibility</li> <li>Guidelines to help industries prevent loss of plastic pellets to the environment</li> </ul>
	Remedial actions	<ul style="list-style-type: none"> <li>Beach and seafloor clean-up activities</li> </ul>
Papua New Guinea	Regulatory Framework and Policies	<ul style="list-style-type: none"> <li>Banned import and manufacture of single-use plastic bags</li> </ul>
	Collaboration	<ul style="list-style-type: none"> <li>Work toward sustainable management of marine resources under a multilateral partnership</li> </ul>
Peru	Regulatory Framework and Policies	<ul style="list-style-type: none"> <li>Established proper waste management system –collection, storage, transportation, treatment (recovery or recycling), disposal (landfill)</li> <li>Prevent discharge of waste from ships and aquaculture industries into the ocean</li> <li>Reduce use of single-use plastics among governmental entities</li> <li>Environmental impact studies on fishery plants that install submarine emissaries offshore</li> </ul>
	Enforcement	<ul style="list-style-type: none"> <li>Surveillance of fishing vessels for illegal waste disposal</li> </ul>
	Initiatives	<ul style="list-style-type: none"> <li>Awareness training for fishers on proper plastic waste management</li> </ul>
	Funding	<ul style="list-style-type: none"> <li>Funding for local and provincial governments to establish proper waste management and disposal</li> </ul>
	Research	<ul style="list-style-type: none"> <li>Impact of microplastics on biodiversity, human health and sustainability of fishery activities</li> </ul>
	Remedial actions	<ul style="list-style-type: none"> <li>Beach and seabed clean-up in polluted areas</li> <li>Considering severe laws against people responsible for marine debris pollution</li> </ul>
	Monitoring	<ul style="list-style-type: none"> <li>Marine debris monitoring as part of beach survey</li> </ul>
The Philippines	Regulatory Framework and Policies	<ul style="list-style-type: none"> <li>Banned single-use plastic bags</li> </ul>
	Initiatives	<ul style="list-style-type: none"> <li>Implemented an economy-wide programme to reduce threats and degradation of coastal and marine ecosystems</li> <li>Encourage recycling/transforming of waste into other products</li> <li>Incentivise plastic segregation in schools and reprimand households that do not practise it</li> </ul>



APEC Economy	Preventive and Remedial Measure	
	Topic	Description
	Collaboration	<ul style="list-style-type: none"> <li>• Work with NGOs to educate and carry out marine conservation and monitoring activities</li> </ul>
Russia	Regulatory Framework and Policies	<ul style="list-style-type: none"> <li>• Established producer responsibility for manufacturers of imported goods</li> </ul>
	Initiatives	<ul style="list-style-type: none"> <li>• Enhance solid waste management and recycling system through provision of waste recycling facilities and collection bins for plastic and other wastes</li> <li>• Aim to liquidate all unauthorised landfills in cities by 2024</li> </ul>
	Infrastructure	<ul style="list-style-type: none"> <li>• Plan to build 220 waste processing plants across the economy by 2024</li> </ul>
	Collaboration	<ul style="list-style-type: none"> <li>• Allow local citizens and NGOs to have a greater influence on the development of infrastructure, and the location of waste collection points and recycling plants</li> </ul>
Singapore	Regulatory Framework and Policies	<ul style="list-style-type: none"> <li>• Established proper waste management system – collection, storage, transportation, treatment (recycling, incineration and waste-to-energy), disposal (landfill)</li> <li>• Strict anti-littering law</li> <li>• Regulate any water pollution from land-based sources</li> <li>• Prevent pollution from ships into the ocean</li> <li>• Forbid discharge of any debris from marine outfall of a water reclamation or desalination plant</li> <li>• Mandatory plastic packaging reporting and reduction plan</li> </ul>
	Initiatives	<ul style="list-style-type: none"> <li>• Encourage people and industries to practice the 3Rs</li> </ul>
	Infrastructure	<ul style="list-style-type: none"> <li>• Convenient access to recycling services</li> <li>• Enhance local recycling industry</li> </ul>
	Funding	<ul style="list-style-type: none"> <li>• Initiate campaigns to encourage consumers to use reusable bags</li> </ul>
	Remedial actions	<ul style="list-style-type: none"> <li>• Coastal and inland water bodies and submarine clean-up exercises</li> <li>• Installation of litter traps and float booms as part of drainage network</li> </ul>
	Monitoring	<ul style="list-style-type: none"> <li>• Identify marine debris at seashores</li> </ul>
Chinese Taipei	Regulatory Framework and Policies	<ul style="list-style-type: none"> <li>• Established proper waste management system – collection, storage, transportation, treatment (recycling, reuse or incineration), disposal (landfill)</li> <li>• Prevent waste discharge at harbour areas</li> <li>• Regulate waste discharge at port facilities</li> <li>• Banned certain plastic items (i.e., microbeads, straws, single-use plastics)</li> </ul>
	Enforcement	<ul style="list-style-type: none"> <li>• Inspect landfill site near rivers</li> </ul>
	Initiatives	<ul style="list-style-type: none"> <li>• Set up recycling stations in villages and harbours</li> <li>• Transport garbage from remote islands</li> </ul>

APEC Economy	Preventive and Remedial Measure	
	Topic	Description
		<ul style="list-style-type: none"> <li>Promote public awareness on marine pollution</li> </ul>
	Remedial actions	<ul style="list-style-type: none"> <li>Clean-up on sea surface and seabed at certain hotspots</li> <li>Fund local governments to conduct clean-up</li> <li>Encourage fishers to retrieve floating marine debris when at sea</li> <li>Gather volunteers with scuba diving skills for seabed clean-up</li> </ul>
	Monitoring	<ul style="list-style-type: none"> <li>Monitor through visual surveys, satellite telemetry and unmanned aerial vehicle</li> </ul>
Thailand	Regulatory Framework and Policies	<ul style="list-style-type: none"> <li>Established strategy to reduce plastic waste and marine debris</li> <li>Restrict certain plastic items (i.e., microbeads, cap seals, oxo-degradable plastics)</li> </ul>
	Initiatives	<ul style="list-style-type: none"> <li>Increase public awareness and encourage behavioural change</li> <li>Enhance plastic recycling management system or infrastructure</li> <li>Adopt 3R concept and encourage the use of innovative materials to reduce waste</li> <li>Waste-to-energy plants to reduce amount of waste and improve quality of waste created</li> </ul>
	Remedial actions	<ul style="list-style-type: none"> <li>Part of global initiative to clean up oceans by engaging with local fishers</li> </ul>
United States	Regulatory Framework and Policies	<ul style="list-style-type: none"> <li>Established proper waste management system – collection, storage, transportation, treatment (reuse, recycling, composting, shredding or incineration), disposal (landfill)</li> <li>Prevent pollution from ships into the ocean</li> <li>Developed a marine debris programme with specific focus on marine debris prevention through prevention, research, removal regional coordination and emergency response</li> </ul>
	Research	<ul style="list-style-type: none"> <li>Source of marine debris and its baseline</li> <li>Impacts of marine debris (i.e., chemical, economic and wildlife through plastic ingestion)</li> <li>Marine debris monitoring</li> <li>Fishing gear improvement projects</li> </ul>
	Initiatives	<ul style="list-style-type: none"> <li>Developed Sustainable Materials Management through maximising materials efficiency over their entire lifecycle</li> <li>Outreach and awareness raising to prevent marine debris pollution</li> </ul>
	Collaboration	<ul style="list-style-type: none"> <li>Implemented Trash Free Waters Program that requires local, government and regional stakeholders to work together to identify problem and gather solutions for marine debris pollution</li> </ul>
	Funding	<ul style="list-style-type: none"> <li>Fund projects that aim to educate and raise awareness on marine debris pollution</li> </ul>
	Remedial actions	<ul style="list-style-type: none"> <li>Shoreline clean-up activities</li> <li>Fishing for Energy project</li> <li>Map and survey marine debris following natural disasters</li> </ul>

APEC Economy	Preventive and Remedial Measure	
	Topic	Description
	Monitoring	<ul style="list-style-type: none"> <li>Established the Marine Debris Monitoring and Assessment Project that compiles marine debris data to assess effectiveness of existing marine debris prevention initiatives</li> </ul>
Viet Nam	Regulatory Framework and Policies	<ul style="list-style-type: none"> <li>Prevent waste discharge from ships into ocean</li> <li>Established an economy-wide action plan on marine debris</li> <li>Restrict single-use plastics</li> <li>Adopted plan to impose strict control of hazardous waste and collection and treatment of solid waste generated in rural areas; and ensure use of only 100 percent eco-friendly plastic bags in supermarkets</li> </ul>
	Initiative	<ul style="list-style-type: none"> <li>Developed plastic waste collection system</li> <li>Public awareness campaign to residents and tourists</li> </ul>
	Remedial Actions	<ul style="list-style-type: none"> <li>Shoreline clean-up activities</li> </ul>

## 5.2 IDENTIFICATION OF GAPS AND NEEDS FOR MARINE DEBRIS MANAGEMENT

A review of the various measures implemented by APEC economies to combat marine debris pollution allows identification of several gaps as summarised below.

### Regulatory framework and policies

Most APEC economies have passed laws to ensure proper solid waste management which help prevent marine debris pollution. Most economies have established general management of domestic and industrial waste with regulations that include proper waste management, anti-littering, prevention of dumping of waste on land (especially beaches) and/or at sea from any ship or vessel. Minimally, waste management laws must be enforced using appropriate incentives and penalties. Even though regulatory systems are in place, there is a need for stricter enforcement, especially in areas where the source of the marine debris (e.g. fishery or illegal dumping) is occurring or known. Subsidies, taxes and levies could be useful instruments for effective waste management and to modify producers' and consumers' behaviour (Gallo & Bongiolatti, 2013). Heavier penalties could help deter industries from creating marine debris pollution.

The legislation could be further improved to include the prevention of all sources of marine debris, including land- or sea-based debris, from entering the ocean. Legislation that is limited in its ability to align with and apply to different levels of governments, especially in coastal and rural areas, could be made more comprehensive. Moreover, insufficient infrastructure especially in rural areas has been highlighted as a key challenge in addressing the marine debris issue in China. Hence, it is necessary for these laws to be supported by adequate waste management infrastructure, particularly in remote and rural areas.

Many economies have drawn from the measures relating to marine debris or plastics waste management found in international conventions, and incorporated them into their legislation. However, economies should consider strengthening the alignment of their policies to these conventions. Challenges remain in domestic implementation. A 2018 report by the United Nations Environment Programme<sup>114</sup> observes that while many economies are party to various international marine-related conventions, domestic implementation in many locations is poor due to low capacity and cultural barriers, among others. Peru noted a lack of personnel, resources and financial support for surveillance of illegal waste disposal from vessels at sea and at beaches as a challenge. Similarly, Singapore listed controlling discharges into waterways and ensuring proper solid waste management as difficulties to address through its Environmental Protection and Management Act and Environmental Public Health Act.

Several APEC economies have banned single-use plastic items (mainly plastic bags) and institutionalised plastic waste recycling as part of their law to prevent marine debris at its source. However, there are challenges in restricting or banning all types of plastics, including microbeads, oxo-biodegradable or compostable plastics. New Zealand has noted the need to improve the resource recovery system by reviewing the quality of recyclables and the plastic processing capacity, and regulating recycled content in plastic packaging, among others.

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<sup>114</sup> UN Environment/COBSEA. "Regional Review of Marine litter in the East Asian Seas Region, zerodraft." April 23, 2018.

Not all economies have adopted comprehensive laws specific to the management of plastic waste and recycling. Most economies agreed there is lack of awareness or incentives to separate waste for recycling. Chinese Taipei and Chile regarded the lack of awareness or incentives as their topmost challenge in addressing plastic packaging. To counter this challenge, some economies have imposed strict measures to ensure appropriate recycling. China strictly enforces the classification of plastic garbage in some cities by imposing fines if the classification does not meet requirements. Japan has the National Action Plan for Marine Plastic Litter that focuses on prevention of marine litter from entering the ocean. Singapore's approach has been to reduce the excessive use of all types of disposables and to promote the use of reusable materials. As such, Singapore does not target plastics alone, as this may simply result in their substitution by other types of materials, which could be more harmful to the environment.

Figure 5.1 provides an overview of marine debris legislation in several APEC economies. It also highlights the exploratory mapping of existing regulatory frameworks to prevent marine debris in certain economies.

### **Institutional framework**

Several APEC economies have committed to economy-wide targets for the reduction of marine debris and plastic waste, and the improvement of recycling rates. However, there is an absence of a clear institutional framework that provides an approach for creating a detailed economy-wide action plan to implement new policies, infrastructures (municipal or recycling facilities), education, research, funding and communication across various relevant stakeholders.

Some economies have adopted economy-wide targets for recycling or plastic reduction. For example, Chile highlighted its commitment to ensuring that 100 percent of plastic containers and packaging are designed to be recyclable, reusable or compostable; and one-third of residential and non-domiciliary plastic containers and packaging are recycled, reused or composted effectively. This requires establishing and communicating a comprehensive action plan to various stakeholders.

### **Collaboration and partnerships**

Marine debris pollution is a complex transboundary environmental issue which has biological, social and economic implications. There is a strong need to establish and strengthen collaborations and partnerships between public and private institutions, locally and internationally. Barriers may inhibit the creation of partnerships at an international level to gather various stakeholders or experts to share their knowledge and experiences in the field, and to develop technologies or solutions to combat marine debris.

Marine debris preventive measures may have an impact on various stakeholders such as industries, consumers, NGOs and the general public. New policies and measures on marine debris may suffer from lack of engagement and constructive feedback from stakeholders during the design and implementation stages. The complexity and severity of the marine debris issue calls for greater collaboration across agencies, organisations and experts. In addressing this barrier, the Chinese Taipei Marine Debris Governance Platform invites relevant agencies and departments to cooperate and participate.

## **Research and innovation**

Several APEC economies have conducted research on microplastics and its impact on the biodiversity and human health within their coastal areas and ocean, but there is insufficient research and understanding on the impact of marine debris on a regional and global scale.

Despite the gradual restriction and ban of plastics in many APEC economies, there is a lack of innovation for alternative materials. This may be due to insufficient funding from government or private institutions, and lack of collaborations among government, the private sector and academia (locally or at the regional or international level).

## **Education and awareness**

In addition to marine debris prevention policies, education and awareness on marine debris pollution is essential to foster behavioural changes in the industry and among individuals. China and New Zealand considered it challenging to adjust single-use based consumption and production patterns. To address this issue, many economies are conducting awareness training about the impact of marine debris pollution and the benefits of plastic recycling to various stakeholders. However, there is a lack of targeted awareness-raising across known marine debris sources, such as industry sectors (e.g., fisheries, aquaculture or tourists) or community groups (e.g., in rural or coastal areas). Partnerships with local or international NGOs could be beneficial in addressing this issue as well.

## **Remedial measures**

Remedial measures such as clean-up activities are increasingly initiated by voluntary organisations and industry bodies, either on an ad hoc or structured basis. Many economies have beach clean-up activities as a remedial measure while some also organise clean-up of marine debris floating at sea or on the seabed (underwater).

Generally, there is still a lack of coordinated efforts and planning for marine debris clean-up activities, including clean-up protocols, guidance on methodologies and centralisation of marine debris data. There may be insufficient funding support as clean-up operations are labour and resource intensive. Clean-up operations of floating debris and debris on the seabed should be planned with adequate financial support and resources. Authorities can take the lead and encourage participation from private institutions and the public (volunteers).

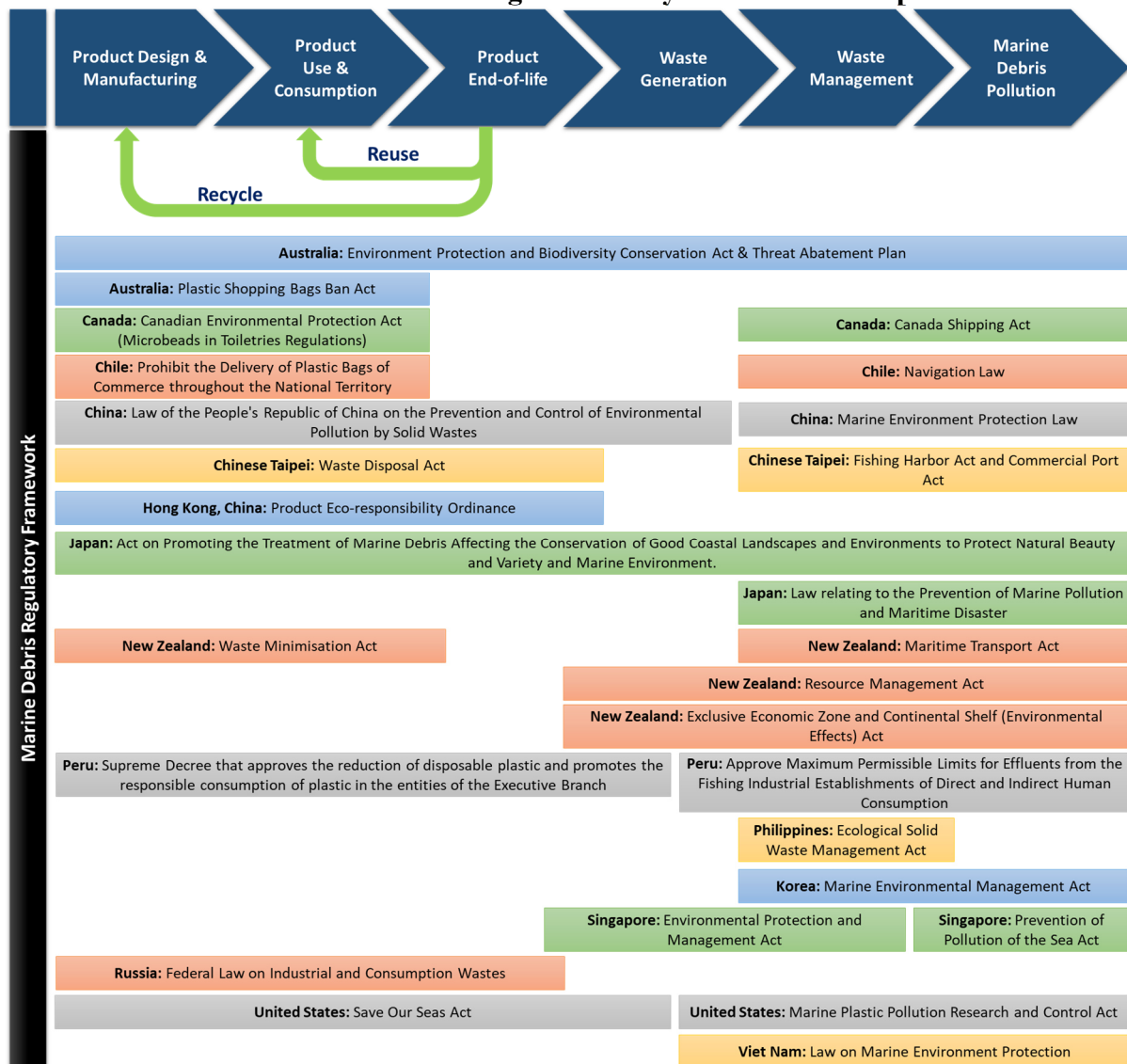
## **Marine debris monitoring**

Many APEC economies are conducting marine debris monitoring, but only as part of their clean-up activities. Methodologies adopted by most economies are limited to visual surveys to identify the type of marine debris. There is a need to have a more effective and efficient monitoring system and wider adoption of current technologies. For example, Chinese Taipei uses technologies such as satellite telemetry and unmanned aerial vehicles to monitor marine debris. Further assessments, such as on source identification and the pathways of the debris, may also be necessary as the data will help in developing effective policies and measures.

New Zealand highlighted the lack of relevant marine debris data as its main challenge to understand the extent of impact and the gaps in materials recovery and waste infrastructure, while Korea focused on accurately measuring the quantity of marine debris. China requires the

government, districts, and solid waste management organisations to report solid waste data including types, production quantity and status of disposal. In overcoming this data deficiency, governments may consider working with local universities. In Singapore, there is an ongoing research collaboration with the National University of Singapore to establish baseline data on marine debris at Singapore’s shores, develop a citizen-science programme to monitor macro-debris and microplastics, and facilitate dialogue with stakeholders to develop recommendations for management approaches.

**Figure 5.1. Mapping APEC economies’ marine debris regulatory frameworks against the waste management lifecycle: several examples**



## 6. CONCLUSION

This report provides a snapshot of the preventive measures currently in place in APEC economies to reduce the entry of plastic waste into the sea. The findings from the direct survey and secondary research show that APEC economies have implemented a wide range of measures, including both regulatory and non-regulatory instruments, to manage marine debris pollution. These measures include legislation for proper waste management, and prevention of illegal waste dumping on land and into waterways or oceans, as well as voluntary measures such as beach clean-ups. There is also enforcement against operations that create marine debris pollution.

The main policies for marine debris reduction are the promotion of recycling and the reduction of plastic usage. Several economies have implemented restrictions and bans on certain plastic materials such as single-use plastics, straws and microbeads. These initiatives require a change in behaviour, hence the importance of education in creating public awareness on marine debris, plastic pollution and the benefits of recycling. Governments or relevant authorities have been taking the lead and collaborating with NGOs or private institutions in these education campaigns. Such partnerships between government and the private sector should extend to research activities to gain a better understanding of the impacts of marine debris or microplastics. Most APEC economies are also conducting remedial measures including beach, sea surface (or floating) and seabed clean-ups to remove marine debris from the ocean.

There is still substantial room for improvement among APEC economies. Stronger enforcement of legislation is necessary with greater collaboration across different levels of governments, agencies, organisations and experts. Several economies have imposed restrictions on the use of plastics, however, there is a lack of innovation on alternative plastics; similarly, improved waste segregation systems are in place but there is a lack of awareness or incentives to practise recycling. There is also a need to explore and adopt new technologies for marine debris monitoring to improve data and enable development of informed policies.



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Annex:

## **Detailed Summary of Survey Responses**

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# 1. CANADA

## 1.1 Laws & Regulations

A summary of the waste management laws and regulations in Canada is found in Table 1 below.

**Table 1: Laws & Regulations associated with Waste Management & Marine Debris in Canada**

Laws & Regulations	Brief Description	Waste Management Processes	Sources
Canada Shipping Act and the Canadian Environmental Protection Act, 1999 (CEPA 1999)	<ul style="list-style-type: none"> <li>Prohibit the discharge or disposal of litter in Canadian waters or by Canadian vessels</li> </ul>	Disposal	Wastes from ships
The Fisheries Act	<ul style="list-style-type: none"> <li>Prohibit the deposit of deleterious substances in to domestic waters frequented by fish</li> <li>Prohibit serious harm to fish and fish habitat</li> </ul>	Disposal	Wastes from ships
Species at Risk Act	<ul style="list-style-type: none"> <li>Protect critical habitat for listed species, including the marine environment for aquatic species at risk</li> </ul>	Disposal	Any debris or rubbish
The Migratory Birds Convention Act, 1994	<ul style="list-style-type: none"> <li>Prohibit the deposit of harmful substances in waters of areas frequented by migratory birds or in places where there the deposit can reach such waters or areas</li> </ul>	Disposal	Any debris or rubbish
The Microbeads in Toiletries Regulations under CEPA	<ul style="list-style-type: none"> <li>Prohibit the manufacture, import and sale of toiletries containing plastic microbeads to reduce plastic microbeads entering Canada's freshwater and marine ecosystem</li> </ul>	Disposal	Waste from the manufacture, import and sale of toiletries
Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations	<ul style="list-style-type: none"> <li>Regulate hazardous waste and hazardous recyclable materials transported across international borders<sup>1</sup></li> </ul>	Disposal	Any hazardous waste of recyclable material

## 1.2 International Conventions

Canada had endorsed a number of international conventions for the management of marine debris, which include:

- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal: Includes binding commitments to increase transparency, tracking as well as control the global trade of non-recyclable plastic waste. It also aims to strengthen the transboundary movement of plastic waste globally.
- Convention on Biological Diversity: It aims to: (1) conserve biological diversity; (2) ensure sustainable use of the components of biological diversity; and (3) fair and equitable sharing of benefits that arise from the use of genetic resources.<sup>2</sup>

<sup>1</sup> <https://ec.gc.ca/gdd-mw/default.asp?lang=En&n=A8D9E099-0&offset=1&toc=show>

<sup>2</sup> <https://www.cbd.int/intro/default.shtml>

- Stockholm Convention on Persistent Organic Pollutants: protect human health and environment from chemicals that remain in the environment for long periods of times, are distributed widely, accumulate in humans and wildlife as well as those that are detrimental to human health or the environment. <sup>3</sup>
- Rotterdam Convention: It aims to cooperation and shared responsibility between parties for the trade of hazardous chemical and contribute to environmentally sound use of these hazardous chemicals. <sup>4</sup>
- International Convention for the Prevention of Pollution from Ships (MARPOL) Annex 1 to 6: covers the prevention of marine environment pollution by ships from operational or accidental causes. Requires economies to ensure vessels are able to dispose waste in ports and that the disposal be complaint with MARPOL Annex V. Canada has implemented this through regulations such as The Canada Shipping Act (2001) and the Vessel Pollution and Dangerous Chemicals Regulation amongst others.
- London Convention (1972) and Protocol (1996) to prevent marine pollution by dumping at sea: prohibits dumping of certain hazardous material to prevent marine pollution.

Non-legislated international relevant commitments include:

- Ocean Plastics Charter: aims to move towards a more resource efficient and sustainable approach towards the management of plastics
- FAO Code of Conduct for Responsible Fisheries: established international standards to conserve, manage and develop aquatic resources with consideration for the eco-system and biodiversity
- Strategic Approach to International Chemicals Management: ensure sound management of the lifecycle of chemicals by the year 2020 to reduce the detrimental impact on the environment and human health <sup>5</sup>
- Marine litter action plan and implementation framework under G20: concerted effort to ‘promote and initiate measures at local, economy-wide and regional levels to prevent and reduce marine litter’ <sup>6</sup>
- G7 Action Plan to Combat Marine Litter: to reduce marine litter from land and sea based sources
- United Nations Clean Seas Campaign: actions to reduce the amount of plastics which are released in the worlds’ oceans
- Global Partnership on Marine Litter: aims to prevent marine litter and micro plastics<sup>7</sup>
- United Nations Sustainable Development Goals, in particular goals 12 and 14
- IMO Action Plan to Address Marine Plastic Litter from Ships

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<sup>3</sup> <http://www.pops.int/TheConvention/Overview/tabid/3351/Default.aspx>

<sup>4</sup> <http://www.pic.int/TheConvention/Overview/tabid/1044/language/en-US/Default.aspx>

<sup>5</sup> <http://www.saicm.org/About/SAICMOverview/tabid/5522/language/en-US/Default.aspx>

<sup>6</sup> <https://www.mofa.go.jp/mofaj/files/000272290.pdf>

<sup>7</sup> <http://marinelitternetwork.com/the-partnership/>



- United Nations Environment Assembly resolutions on marine plastic litter and microplastics

### **1.3 Preventive Measures**

To prevent plastic waste and marine litter, Canada has launched the Canada-wide Strategy for Zero Plastic Waste. It also adopted its phase 1 action plan in 2019 to: develop consistent extended producer responsibility programs, create a roadmap to address single-use and disposable plastics, support recycling infrastructure and innovation in plastic manufacturing as well as identify tools for green procurement practices. The introduction of Phase 2 in 2020 will identify actions to improve consumer, business and institutional awareness; reduce waste and pollution from aquatic activities; advance science, capture and clean-up debris in the environment; and contribute to global action.

Additionally, Canada introduced Microbeads in Toiletries Regulation in 2017. Based on the regulation, the manufacture, import and sales of toiletries that contain microbeads are prohibited.

Canada also published the Canadian Plastics Science Agenda that spans the the lifecycle of plastics to inform future science and investments for: detecting plastics in the environment; understanding and mitigating its impact on the environment; and advancing sustainable plastic production, recycling and recovery.

Other efforts also include amongst others, hosting forums to allow for information exchange (e.g. Best Brains Exchange on the Ecological and Human Health Fate etc.) and committing \$2 million towards research on the impact of micro plastics on aquatic ecosystems. It also aims to increase awareness of waste and pollution through engagement sessions with communities and organisations. For instance, Environment and Climate Change Canada provide funds of over \$3 million to support the reduction of plastic waste and marine litter.

### **1.4 Remedial Measures**

Apart from preventive measures, remedial measures have also been undertaken with Canada committing over \$10 million towards innovation challenges addressing plastic waste. Fisheries and Oceans Canada have also provided \$8.3 million to clear waste in the ocean specifically fishing gear. Apart from initiatives to clean waste it has also invested in increasing awareness with Environment and Climate Change Canada providing over \$3 million to awareness and educational campaigns (e.g. 10,000 Changes), shoreline clean-ups, and community projects.

### **1.5 Funding and Research**

Funding for marine debris prevention is largely attained from the government with it having funded several initiatives which include, amongst others:

- \$2 billion investment to provide communities with more reliable water and wastewater systems
- Investing in innovative technology to tackle plastic pollution (e.g. providing \$10 million to Canadian businesses)

- Awareness campaigns and community action (e.g. Environment and Climate Change Canada provided over \$3 million to support on-the-ground projects and awareness and education campaigns; Fisheries and Oceans Canada announced \$8.3 million in funding to get rid of fishing gear)
- Committing \$100 million towards the goals of the Ocean Plastics Charter, which brings together governments, businesses and civil society organisations to commit to take actions to eradicate plastic pollution and resolve to take a lifecycle approach to plastic stewardship on land and at sea

Further to funding initiatives, Canada conducts and invests in research. It has also convened researchers through initiatives such as the Best Brains Exchange on the Ecological and Human Health Fate as well as the Effects of Micro-plastic Pollution and Science Symposium. The Canadian Plastics Science Agenda was published in 2019 to inform future research and science investments across the lifecycle of plastics. There have also been efforts undertaken to disseminate this research to the public.

## **1.6 Land-Based Marine Debris Preventive Measures**

Some initiatives Canada has undertaken to prevent land based marine debris from entering the marine environment include:

- Implementing tax/fee or bans on single use plastics (e.g. North West Territories now implement a 25 cent fee on plastic bags)
- Providing a subsidy, rebate or incentive (e.g. deposit returns for bottles)
- Extended Responsibility Programs (in all provinces and territories, excluding Nunavut)
- Awareness and Educational Programs (e.g. 10,000 Changes and Be Plastic Wise national campaigns)
- Waste collection and recycling programs (e.g. Municipals have introduced local waste programs and anti-litter by-laws)

## **1.7 Land-Based Marine Debris Remedial Measures**

Some initiatives Canada has undertaken to reduce land based marine debris from entering the marine environment include:

- Supporting community shoreline clean-ups and fishing gear removal and collecting citizen science
- Enforcing anti-litter laws
- Use of technologies to better trap micro plastics in wastewater and advancing methods to collect and assess microplastics in the environment
- Adequate waste management facilities, including in areas such as harbours and ports
- Collect data on the quantity and type of marine litter

## 1.8 Sea-Based Marine Debris Remedial Measures

With regards to sea-based marine debris, Canada requires commercial fishers to report lost and retrieved fishing gear. It has committed over \$8 million to support this initiative. Furthermore, Canada joined the Global Ghost Gear initiative that aims to remove abandoned or lost gear.

In the same vein, Canada has put-in-place the Canadian Environmental Protection Act which deals with the disposal of waste from structures (e.g. ships, aircrafts). It also regulates the disposal of non-hazardous substances under the Disposal at Sea regulations.

Other initiatives have also been undertaken such as the Wrecked, Abandoned or Hazardous Vessels Act to address abandoned and derelict vessels.

## 1.9 Marine Debris Monitoring

**Table 2: Marine Debris Monitoring in Canada**

Monitoring Methods	Source Identification Methods	Detailed Description
Detection and Analysis		<ul style="list-style-type: none"><li>• Conducts and support research on plastic economy in Canada</li><li>• Launched Canada’s Plastics Science Agenda in 2019</li><li>• Currently completing science summary of plastic pollution</li></ul>
Citizen Science	Visual Identification	<ul style="list-style-type: none"><li>• Supporting the Great Canadian Shoreline Clean-up</li></ul>

## 2. CHILE

### 2.1 Laws & Regulations

A summary of the waste management laws and regulations in Chile is found in Table 3 below.

**Table 3: Laws & Regulations associated with Waste Management & Marine Debris in Chile**

Laws & Regulations	Brief Description	Waste Management Processes	Sources
Law No. 18695, Constitutional Organic of Municipalities	<ul style="list-style-type: none"> <li>Establish that the cleaning and decoration of the communes is a private function of the municipalities</li> <li>Ensure domestic waste collection, transportation &amp; disposal.</li> </ul>	Collection, transportation & disposal	Domestic wastes
Law N°2.222, (Article N°142)	<ul style="list-style-type: none"> <li>Prohibit the disposal of debris or rubbish or other harmful substances, of any kind, which cause damage or harm to the waters subject to the economy-wide jurisdiction, in ports, rivers and lakes.</li> <li>Regulates things related to navigation, ships, naval artifacts, ports, maritime terminals, navigation crew, contaminations control and preventive measures.</li> </ul>	Disposal	Any debris or rubbish
Regulation N° 320, Environmental Regulation for Aquaculture,	<ul style="list-style-type: none"> <li>Require aquaculture facilities to adopt measures to prevent the dumping of waste.</li> <li>Maintain the cleanliness of the beaches and beach areas surrounding the facility of cultivation of all solid waste generated by aquaculture.</li> </ul>	Disposal, General waste management.	Aquaculture wastes
Regulation N°1.340, General regulation of Order, Security and Discipline in the ships and coast of the Republic	<ul style="list-style-type: none"> <li>Establish the prohibition of throwing garbage or rubbish on beaches, there is no specific penalty fee, but the article 342 states that the Captain of the Port has the faculties to penalty.</li> <li>Any infringement of the articles of this Regulation in which the penalty is not specified, will be sued to the offender to a discretionary fine that will be applied by the said official.</li> </ul>	Disposal	Wastes from ships
Regulation N°1, Regulation for the Control of Aquatic Pollution	<ul style="list-style-type: none"> <li>Prohibit the disposal of rubbish or garbage or any wastes or harmful substances, of any kind, that cause or may cause damages in the waters subject to economy-wide jurisdiction and in ports, rivers and lakes.</li> <li>Addresses the issue of Prevention of Contamination by Garbage from Ships and Naval Artifacts, that considers 5 articles.</li> </ul>	Disposal	All rubbish, garbage and wastes from ships and naval artifacts.

## 2.2 International Conventions

Chile has adopted legislations from international conventions, for management of marine debris, including:

- MARPOL Annex V Prevention of Pollution by Garbage from Ships: this is regulated by controlling Ships that are at port, dispose their garbage in Port reception facilities and the Garbage Management Plans are inspected.
- LONDON Convention 1972 and Protocol: this protocol treats on the Prevention of Marine Pollution by Dumping of Wastes and Other Matters.
- UN Convention on the Law of the Sea: this focuses the environmental scope throughout the Regional Sea Programmes. Chile is also a member of CCPS (Committee on Sustainable Consumption and Production) which provides support in conducting adequate valuation of their marine and coastal ecosystems in order to raise awareness of their economic importance for the benefit of their population. In addition, the CCPS as Executive Secretary of the 1981 Convention of Lima and the Action Plan carries out activities to monitor and control marine pollution in each of the member economies, allowing an up-to-date overview of the state of ocean health in the Southeast Pacific region.
- FAO Code of Conduct for Responsible Fisheries: the fisheries fleet is to obey the article “8.7 Protection of the aquatic environment”, that states that garbage has to “Owners, charterers and managers of fishing vessels should ensure that their vessels are fitted with appropriate equipment as required by MARPOL 73/78”.
- Other conventions include Basel Convention, Stockholm Convention and Minamata Convention

## 2.3 Preventive Measures

Based on the survey response, Chile’s main sources of land-based marine debris are from:

1. Household and general littering (most common)
2. Tourism and coastal recreation
3. Waste management and collection
4. Toilet and sewer overflow (least common)

The main preventive measure is the passing of Law 21.100 which prohibits the commerce of plastic bags throughout Chilean territory. Reduction in plastic usage will therefore decrease the amount of plastics that will end up in the sea. Another measure is to increase awareness on marine debris impact on the environment. This can be done through campaigns organised by NGOs or private organisations with support from Chilean government.

## 2.4 Remedial Measures

Remedial measure for marine debris is the beach cleanup which occurs during International Coastal Cleanup that is an economy-wide event organised by DIRECTEMAR (The General Directorate of the Maritime Territory and Merchant Marine). The programme aims to prevent garbage from beaches entering the sea and promoting awareness on impact of marine debris to public through schools and other social media.

Waste management measures that are most relevant (as ranked) to Chile are:

1. Ban of certain products (e.g. single-use plastics)
2. Voluntary beach clean-up programs
3. Voluntary, centralised collection of certain products in exchange of a community benefit
4. Phasing-out / Ban of certain items or materials
5. Underwater clean-ups in hot-spot areas (e.g. can be divers or using ‘Sea-Trash Collector’)
6. Improved cleaning operations in certain areas
7. Promote recycling campaigns

Based on the survey response, Chile’s main sources of sea-based marine debris are from:

1. Aquaculture (most common)
2. Professional and recreational fishing
3. Shipping Sector
4. Port activities
5. Offshore industries (least common)

The regulations and laws associated with sea-based marine debris from submarine emissaries, naval artifacts and aquaculture is as described in Section 3.1.1 above.

The remedial measures for marine debris include:

- Establish programmes for identifying and mapping of garbage sinks across the coastline
- Generate collaborative alliances (private/public/academia) for monitoring and collecting of marine debris
- Improve enforcement of the MARPOL Annex V and control of the fishing nets and fishing gear like plastic in the fishing fleet, from SMEs to big fisheries
- Increase awareness raising within the shipping, aquaculture and fishing sector
- Ensure adequate port reception facilities are in place
- Develop voluntary programs for reducing plastic packaging on board vessels

Chile has also established a National Work Group to address issues on marine debris and microplastics.

## 2.5 Research & Funding

Funds for marine debris research are available from the Chilean government and provincial level, as well as local universities. For example, Científicos de la Basura, a citizen science program, has received funding from National Commission for Scientific and Technological Research to study marine debris and microplastics throughout Chile.

## 2.6 Marine Debris Monitoring

**Table 4: Marine Debris Monitoring in Chile**

Monitoring Methods	Source Identification Methods	Detailed Description	Findings
GESAMP method	Anthropogenic litter in beaches	<ul style="list-style-type: none"> <li>• Begun in 2019.</li> <li>• Led by the Maritime Authority</li> </ul>	Still in progress.

Monitoring Methods	Source Identification Methods	Detailed Description	Findings
		<ul style="list-style-type: none"> <li>• Monitoring is conducted by the marine biologist and environmental engineers that work at GESAMP, in some places with help from universities students.</li> <li>• Frequency: every 6 months</li> <li>• Location: 13 beaches throughout Chile.</li> </ul>	

## 2.7 Current Measures on Plastic Wastes

Plastic waste is collected, transported and disposed of together with the rest of the waste generated at the household level, mainly to be disposed of in landfills. Along with the above, there are some systems of voluntary delivery, in green points or clean points of PET plastic for subsequent recycling.

Chile has made a public commitment to move towards a “New Plastics Economy”, and in October 2018, signed the “Global Commitment of the New Economy of Plastics” by the UN to commit to implementing measurable policies to make and report tangible progress by 2025. Some commitments include:

1. Take actions to eliminate single-use plastic containers and utensils that are problematic or unnecessary through redesign and innovation.
2. 100% of plastic containers and packaging must be designed to be recyclable, reusable or compostable.
3. 1/3 of residential and non-domiciliary plastic containers and packaging must be effectively recycled, reused or composted.
4. The plastic containers and packaging must have, in their different formats, an average of 25% recycled material.

With the commitment above, Chile has invited all companies and organisations including NGOs, universities, consumer associations, municipalities to voluntarily join the Pact and contribute to the development of the new economy of plastics.

A new law (No. 20,920) also introduces the Extended Producer Responsibility (EPR) for packaging, among which are plastic containers. It is expected that during the year 2022 the EPR for containers and packaging will come into force.

## 2.8 Challenges & Opportunities

Marine debris pollution has economic implications on Chile aquaculture, tourism and fisheries industries. The debris is also known to block the uptake of water by the desalination and thermoelectrical plants. Additionally, marine debris also has a negative impact on marine animals due ingestion and entanglement.

The 5 most relevant gaps on plastic packaging in Chile are as identified in Table 5 below:

**Table 5: Most Relevant Plastic Packaging Gaps in Chile**

Rank	Most relevant gaps in plastic packaging
1	Lack of awareness or incentives to separate waste for recycling
2	Lack of measures to reduce the production of plastic packaging (e.g. bags, bottles, EPS fish boxes)
3	Production and consumption patterns based on single-use/disposable items rather than reduce and re-use
4	Deficient separate collection infrastructure for plastic packaging waste
5	Decoupling between design/production and recycling – products are designed without its whole life-cycle in view

Direct preventive measures worth considering by Chile and ranked based on the level of priority are:

1. Eco-design to avoid waste generation or to enhance reuse or recyclability (Highest priority)
2. Enhanced waste collection on land
3. Enhanced waste treatment chains, avoiding escapes of waste to the environment (e.g. daily covered or better managed landfills)
4. More public bins to avoid fly-tipping
5. Better acceptance facilities for ships

Indirect preventive measures worth considering by Chile and ranked based on the level of priority are:

1. Awareness raising and information: measures focusing on changing behaviour, labelling and certification, communication, education, training etc (Highest priority)
2. Legal and obligations: command and control measures.
3. Enhanced enforcement
4. Subsidies, taxes and levies: direct positive and negative economic incentives
5. Other Economic of Market-based Instruments: green public procurement, purchase specifications, price regulation, costs for goods and services, fee-based systems and trading systems

Overall, Chile has proposed APEC economies to collaborate in the following areas:

1. Determine the best type of monitoring to see the effectiveness of the measures taken to prevent marine debris.
2. All economies adopt the Roadmap on marine debris to put an end to marine debris in the ocean.
3. Establish a yearly economy workshop held by each economy to help level all economies to establish similar preventive measures to prevent marine debris from entering the ocean and control land based marine debris; to compare results of monitoring programs and help economies level up; and in these workshops give building capacities to economies that are less developed.



### 3. CHINA

#### 3.1 Laws & Regulations

China remains the economy with the largest population in the world at 1.44 billion based on a United Nations population estimates and projections<sup>8</sup>. Municipal solid wastes generated are increasing due to the large population, economic growth and rapid urbanisation. In addition, China was the world’s largest waste importer for decades until the import ban on solid wastes including plastic waste, unsorted paper waste and textile waste since January 2018. China since has shifted its focus on municipal waste management.

A summary of the waste management laws and regulations in China is found in **¡Error! No se encuentra el origen de la referencia.** below.

**Table 6: Waste Management Laws & Regulations in China**

Laws & Regulations	Brief Description	Waste Management Processes	Sources
Law of the People’s Republic of China on the Prevention and Control of Environmental Pollution Caused by Solid Waste <sup>9</sup> (Revised draft)	<ul style="list-style-type: none"> <li>• Emphasise the importance of preventing environmental pollution during the solid waste management process through proper waste collection, storage, transportation, treatment, disposal and source reduction.</li> <li>• Require Governmental District/City and solid waste management organisations to report solid wastes data including types, production quantity, status of disposal &amp; etc. Info must be publicly available.</li> <li>• Required to engage qualified organisations for municipal waste transportation.</li> <li>• Importation of restricted solid waste and interprovincial transport of solid wastes are only allowed with the authorities’ approval.</li> <li>• Solid waste treatment shall meet relevant pollution control standards including <i>Standard for pollution control on the municipal solid waste incineration</i> (GB 18485-2014) and <i>Technical guidelines for solid waste treatment &amp; disposition engineering</i> (HJ 2035-2013).</li> <li>• Prevent environmental pollution caused by illegal solid wastes storage, disposal or dumping.</li> <li>• Solid waste disposal shall meet relevant pollution control standards such as <i>Standard of assessment on municipal solid waste landfill</i>.</li> <li>• Establish production standards to prevent over-packaging. Promote the design and manufacture of recyclable.</li> </ul>	Collection, storage, transportation, treatment, disposal and source reduction.	Municipal solid wastes; Agriculture; Livestock and farming on a large scale; Mining; Industrial solid waste; Imported hazardous wastes.
Environmental Protection Law of	<ul style="list-style-type: none"> <li>• General environmental law on environmental protection, prevent pollution, safeguard public</li> </ul>	Collection, recycling,	Municipal waste, industrial

<sup>8</sup> <https://www.un.org/en/sections/issues-depth/population/>

<sup>9</sup> [http://www.mee.gov.cn/gkml/sthjbgw/stbgth/201807/t20180717\\_446712.htm](http://www.mee.gov.cn/gkml/sthjbgw/stbgth/201807/t20180717_446712.htm)

Laws & Regulations	Brief Description	Waste Management Processes	Sources
the People's Republic of China	<p>health, promoting of sustainable economic and social development.</p> <ul style="list-style-type: none"> <li>• Encourage eco-friendly or recycled product to reduce wastes.</li> <li>• Promote sorting and recycling of municipal solid waste.</li> <li>• Prohibition of dumping wastes in sea</li> </ul>	transportation and disposal.	and agricultural wastes.
Law of the People's Republic of China on Evaluation of Environmental Effects	<ul style="list-style-type: none"> <li>• Requires evaluation of environmental effects or Environmental Impact Assessment (EIA) of a construction project prior to its development.</li> <li>• EIA report shall include impact assessment, preventive &amp; mitigation measures as well as a monitoring plan for the project.</li> <li>• Public consultation and review of the EIA is required.</li> </ul>	Source reduction	Construction wastes
Regulations for the Administration of the Recovery and Disposal of Waste Electric and Electronic Products	<ul style="list-style-type: none"> <li>• Focus on the recovery and disposal of waste electrical and electronic product and promoting the development of a circular economy.</li> </ul>	Recycling, disposal and recovery.	Electrical and electronic wastes.
City Appearance and Environmental Sanitary Management Regulations	<ul style="list-style-type: none"> <li>• Provide guidelines for municipal solid waste disposal practices.</li> </ul>	Disposal	Municipal solid wastes

China's legal framework applicable for marine waste management is the *Marine Environmental Protection Law of the People's Republic of China, 2000*. The law aims to reduce both land-based and sea-based debris from entering the sea. In relation to marine debris, the disposal of garbage on beaches and seashores is prohibited. All vessels and ports within China's jurisdiction should have their garbage storage facilities and measures to prevent any waste discharge into the sea. Permits need to be obtained for any vessels that want to dump waste within the Chinese marine environment.

The law is enforced by China's Maritime and Fishery Department, which can impose administrative penalties and provide incentives for the reporting of illegal dumping activities (*Article 5* of the law). The authorities can impose penalties or order a vessel to make corrections within a stipulated timeframe on owner or operator of the ship when:

- Pollutants or other substance prohibited under the Marine Environmental Protection Law are discharged into coastal waters;
- Failure to comply with the Marine Environment Protection Law which also stipulates that pollutants shall not be over-discharged into the ocean;
- Discharging of wastes in to the ocean without obtaining a valid dumping permit;
- Failure to take immediate actions after causing marine environmental pollution due to accidents or unexpected events.

China is part of the International Convention for the Prevention of Pollution from Ships (MARPOL), and has incorporated regulations from Annex V into its economy-wide legislation. One such example is the provision of sufficient waste facilities at ports and terminals to meet the needs of arriving ships.

### **3.2 Preventive & Remedial Measures**

Waste management measures that are most relevant (as ranked) for China are:

1. Voluntary beach clean-up programs
2. Improved enforcement on improper disposal into waterways
3. Improved cleaning operations in certain areas
4. Promote recycling campaigns
5. Awareness raising for good waste management offshore
6. Levy or tax on certain products (i.e. frequently end up as marine debris such as plastic bags and packaging)
7. Ban of certain products (e.g. single-use plastics)
8. Improved enforcement of current maritime legislation
9. Promotion of waste collection at the port
10. Underwater clean-ups in hot-spot areas (e.g. can be divers or using ‘Sea-Trash Collector’)

In development of the waste management measures, good regulatory principles have been applied. These policies will be standardised and fair to all producers and consumers. They will be first implemented in one or several cities as trials to gather feedbacks prior to larger scale implementation. Stakeholder consultations are conducted throughout the policy development process and all relevant feedbacks are taken into considerations. Feedbacks are monitored regularly following policy implementation. If implementation is unsuccessful, the policy will be withdrawn to save resources.

China’s central and provincial governments have funds to prevent and control marine pollution (e.g. Blue Bay Action Plan). Almost all coastal municipal governments have budgets for solid waste disposal. Some cities such as Xiamen, Shenzhen, Weihai and Wenzhou, have also formulated plans to allocate special funds in the field of marine debris.

Current research studies are focused on product substitution and solid waste management technology. Their sources of funding include departmental functional funds, natural science funds and social science funds from the government.

### **3.3 Land-based Marine Debris Preventive Measures**

Based on the survey response, China’s main sources of land-based marine debris are from:

1. Household and general littering (most common)
2. Waste management and collection
3. Tourism and coastal recreation
4. Toilet and sewer overflow
5. Agricultural plastic film
6. Industrial activities (least common)

The main preventive measures for land-based marine debris are enforcement by patrolling on waterways and product substitution to reduce pollution. Water policemen and cleaners are

deployed to patrol the waterways to prevent illegal dumping of wastes into the sea. However, this may not be effective for rural streams which are inaccessible. Garbage from the riverbanks will eventually flow to the ocean creating marine debris.

To prevent and mitigate marine debris at source, restrictions on use of disposable plastic bags and promotion of use of biodegradable plastics were implemented. The production, sale and use of plastic shopping bags with thickness less than 0.025mm were prohibited economy-wide in China from 1<sup>st</sup> June 2008. The measure is partially effective as it is difficult to control the excessive use of plastic bags by consumers. Plastic bags are commonly used in food packaging and cannot be prohibited due to lack of an alternative eco-friendly bag. Only the larger markets can enforce the restriction of plastic bags use. Another mitigation is to encourage scientific research and produce film mulches and commodity packaging that are recyclable or biodegradable in the environment. However, there are no products that can biodegrade rapidly in the composting environment.

The key concern for China is potential biological impacts due to the high level of microplastics in the sea. Research in 2016 showed that the density of microplastics in the surface layer of sea water near China is 0.29 per square metre. Taking a case discovered by Guangdong Maritime Police as an example, 564 tons of domestic waste were dumped into the sea, resulting in an estimated economic loss of 1.65 million yuan for ecological restoration.

The most effective remedial measures proposed would be to start the clean up on areas with large amounts of marine debris such as mangroves. This would require working with non-governmental organisations (NGO) to conduct regular clean-up activities at these mangroves.

### **3.4 Sea-based Marine Debris Preventive Measures**

Based on the survey response, China's main sources of sea-based marine debris are from:

1. Aquaculture (most common)
2. Professional and recreational fishing
3. Shipping Sector
4. Port activities
5. Offshore industries (least common)

The remedial action for sea-based marine debris is to conduct submarine debris salvage at specific sea areas such as harbours, estuaries and aquaculture areas (common source of sea-based marine debris).

### **3.5 Marine Debris Monitoring**

The marine debris monitoring method implemented by China and their details are provided in **¡Error! No se encuentra el origen de la referencia.**<sup>7</sup> below.

**Table 7: Marine Debris Monitoring in China**

Monitoring Methods	Source Identification Methods	Detailed Description	Findings
Sea surface trawl	Classified Counting (plastic types)	<ul style="list-style-type: none"> <li>• Conducted by various marine environmental monitoring stations at sea.</li> <li>• Frequency: Annually.</li> <li>• Location: Numerous sites around China.</li> </ul>	Plastic bags and packaging are the most common
Submarine trawl	Classified Counting (plastic types)	<ul style="list-style-type: none"> <li>• Conducted by various marine environmental monitoring stations at sea.</li> <li>• Frequency: Annually.</li> <li>• Location: Numerous sites around China.</li> </ul>	Plastic bags and packaging are the most common
Beach survey	Classified Counting (plastic types)	<ul style="list-style-type: none"> <li>• Conducted by various marine environmental monitoring stations at sea.</li> <li>• Frequency: Annually.</li> <li>• Location: Numerous sites around China.</li> </ul>	Plastic bags and packaging are the most common

With the monitoring conducted, there is an increase in public awareness on the extent of marine debris pollution issue around China.

### 3.6 Current Measures on Plastic Wastes

The current practice in China for plastic wastes is to recycle valuable plastics whilst those of low economic value are disposed in landfills. With the development of plastic waste classification (or sorting), the proportion of waste being incinerated and recycled has increased. The measure to increase plastic recycling is economy-wide and requires collaboration between garbage recycler, consumer and the local government. Mandatory garbage sorting for all public institutions and companies will also be implemented across 46 cities in China by 2020. In some cities, the classification of plastic garbage is strictly enforced. Failure to classify plastic garbage according to the requirements will be fined.

Policies and measures for single-use plastic are the restriction of disposable plastics and promotion of using recyclable or biodegradable plastics (as described in Section above).

The principle of waste hierarchy has been adopted in which single-use plastic production is restricted or minimised, followed by recycling or disposal at landfill. By 2020, municipal solid waste classification and treatment systems will be basically built in 46 key cities. On June 25, 2019, the Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste (Revised Draft), including the Mandatory Classification of Domestic Waste, was submitted for consideration. Compulsory classification of domestic waste will be fully implemented.

### 3.7 Challenges & Opportunities

The main challenge faced by China when tackling marine debris issues is the inadequate waste management infrastructure in rural areas. Efforts to increase the infrastructure at these rural areas were also ineffective.

The 5 most relevant gaps on plastic packaging in China are as identified in **¡Error! No se encuentra el origen de la referencia.**8 below:

**Table 8: Most Relevant Plastic Packaging Gaps in China**

Rank	Most relevant gaps in plastic packaging	Explanation
1	Production and consumption patterns based on single-use/disposable items rather than reduce and re-use	Because the income of residents is still not high and the demand is strong, the society has the inertia to use high-yield and low-cost disposable goods.
2	Insufficient collection coverage of municipal waste	Rural areas which are less accessible will have lesser frequency of collection of recyclables.
3	Lack of awareness or incentives to separate waste for recycling	Older generation are used to waste sorting for recycling, but there is a lack of awareness in younger generation to recycle and/or require more time to adapt.
4	Inappropriate waste collection and separation facilities (e.g. bins without lids in coastal areas)	Lack of separation facilities in most areas.
5	Inappropriate behaviour when disposing litter (e.g. during activities along the coast, particularly impact related to tourism, etc.)	As incomes rise, such behaviour is declining rapidly.

Direct preventive measures worth considering by China and ranked based on the level of priority are:

1. Enhanced waste collection on land (Highest priority)
2. Eco-design to avoid waste generation or to enhance reuse or recyclability
3. Installation of Video surveillance facilities or floating debris interception activities in streams passing through residential areas.
4. More public bins to avoid fly-tipping
5. Beach clean-up actions (Lowest priority)

Indirect preventive measures worth considering by China and ranked based on the level of priority are:

1. Awareness Raising and Information: measures focusing on changing behaviour, labelling and certification, communication, education, training
2. Enhanced Enforcement
3. Other Economic of Market-based Instruments: green public procurement, purchase specifications, price regulation, costs for goods and services, fee-based systems and trading systems.
4. Monitoring: in function of awareness raising, source and loophole detection and further policy planning.
5. Subsidies, Taxes and Levies: direct positive and negative economic incentives.
6. Research Oriented Measures: e.g. on prevention, recyclability and biodegradability.

As a first step to address marine debris issues, China proposed APEC economies to collaborate on formulating uniform packaging standards for imported and exported products to prevent over-packaging. Additionally, form the product material substitution recommendation lists on the premise of meeting the capacity.

## 4. JAPAN

### 4.1 Laws & Regulations

A summary of the waste management laws and regulations in Japan is found in Table 99 below.

**Table 9: Laws & Regulations associated with Waste Management & Marine Debris in Japan**

Laws & Regulations	Brief Description	Waste Management Processes	Sources
Waste Management and Public Cleansing Law	<ul style="list-style-type: none"> <li>Establish a clean-living environment and improve public health through the restriction of waste discharge, appropriate sorting, storage, collection, transport, recycling, disposal of waste</li> </ul>	sorting, storage, collection, transport, recycling, disposal, incineration, composting, landfill	Municipal & Industrial waste
Act on Promoting the Treatment of Marine Debris Affecting the Conservation of Good Coastal Landscapes and Environments to Protect Natural Beauty and Variety and Marine Environment.	<ul style="list-style-type: none"> <li>Provide basic principles for measures required for the smooth removal action of marine debris and effective reduction of its generation</li> <li>Define the responsibilities of the economy-wide and local governments, business entities and the people of Japan, while setting out the basic policy established by the economy-wide government and other necessary matters for promoting measures against articles that drift ashore</li> <li>Provide funding to municipalities to collect and process marine debris</li> </ul>	Reduction at source, treatment, Recycling	Marine litter
Law Relating to the Prevention of Marine Pollution and Maritime Disaster	<ul style="list-style-type: none"> <li>Establish measures to prevent marine pollution and maritime disasters by controlling discharge of wastes from ships, offshore facilities</li> </ul>	Disposal	Wastes discharge from ships and offshore facilities
Container and Packaging Recycling Law	<ul style="list-style-type: none"> <li>Establish the responsibilities of consumers, municipalities and businesses on proper handling of waste through sorting, collection and recycling.</li> </ul>	Sorting, collection, recycling.	General waste

### 4.2 International Conventions

Japan has adopted measures to address marine debris issues from treaties including:

- International Convention for the Prevention of Pollution from Ships
- Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter and 1996 Protocol
- International Convention on Oil Pollution Preparedness, Response and Cooperation
- International Convention for the Control and Management of Ships' Ballast Water and Sediments

Restrictions defined in these conventions were incorporated in the Law relating to the Prevention of Marine Pollution and Maritime Disaster.



### 4.3 Preventive & Remedial Measures

To prevent marine plastic pollution, Japan has initiated the Resource Circulation Strategy for Plastics, which aims to have zero marine plastic pollution through the emphasis on 3Rs (Reduce, Reuse & Recycle), proper waste handling, prohibition of littering and illegal dumping and promotion of clean-up activities.

Japan declared the National Action Plan for Marine Plastic Litter to realise a world without additional pollution by plastic litter. Some measures from the action plan include:

1. Promotion of proper waste management system
2. Prevention of littering, illegal dumping and unintentional leakage of waste into the oceans
3. Collection of scattered waste on land
4. Recovery of plastic litter in the oceans
5. Innovation in development of alternative materials and conversion to those
6. Collaboration with stakeholders
7. International cooperation for promoting measures in developing economies
8. Survey on actual situations and accumulation of scientific knowledge.

### 4.4 Research

Additionally, Japan's Ministry of the Environment is funding a marine plastic litter research conducted by Kyushu University from 2018 to 2020. The research aims to understand the distribution of marine plastic in the ocean from its coasts to a global scale, the ecological impact of marine plastics and improve the measuring methods of marine plastics.

### 4.5 Partnership

Partnership and joint efforts between the government, private institutions and public are also established for the prevention of marine debris pollution, for example, the Marine Plastic Public Private Innovation Partnership was set up to support innovations such as developing substitute materials. An economy-wide clean-up campaign, UMIGOMI Zero Week, was organised as a joint effort with Nippon Foundation and recorded more than 400,000 participation to reduce marine waste.

### 4.6 Marine Debris Monitoring

Marine debris monitoring is implemented as required under the Act on Promoting the Treatment of Marine Debris Affecting the Conservation of Good Coastal Landscapes and Environments to Protect Natural Beauty and Variety and Marine Environment. Table 1010 summarises the details of marine debris monitoring conducted by Japan.

**Table 10: Marine Debris Monitoring in Japan**

Monitoring Methods	Source Identification Methods	Detailed Description	Findings
Beach survey	Classification	<ul style="list-style-type: none"><li>• Conducted by Japan's Ministry of the Environment</li></ul>	Mainly plastic bottles, fishing gears, other plastic materials and

Monitoring Methods	Source Identification Methods	Detailed Description	Findings
		<ul style="list-style-type: none"> <li>• Annual monitoring since 2009.</li> <li>• At 10 locations in Japan</li> </ul>	natural articles such as wood (high proportion)
Floating debris survey	Classification	<ul style="list-style-type: none"> <li>• Conducted by Japan's Ministry of the Environment</li> <li>• Annual monitoring since 2014.</li> <li>• At 2 to 3 bays and around 70 stations in offshore areas</li> </ul>	Mainly plastic materials and natural articles such as wood (high proportion)
Sea bed debris survey	Classification	<ul style="list-style-type: none"> <li>• Conducted by Japan's Ministry of the Environment</li> <li>• Annual monitoring since 2014.</li> <li>• At 2 to 3 bays and around 3 stations in offshore areas</li> </ul>	Mainly plastic and metal materials

## 5. KOREA

### 5.1 Laws & Regulations

A summary of relevant solid waste management laws and regulations in Korea is described in **¡Error! No se encuentra el origen de la referencia.**<sup>1</sup> below.

**Table 11: Waste Management Laws & Regulations in Korea**

Laws & Regulations	Brief Description	Waste Management Processes	Sources
Marine Environment Management Act	<ul style="list-style-type: none"> <li>• Prevention of marine pollution (discharge of pollutants) caused by ships</li> <li>• Prevention of any land-based wastes into sea</li> <li>• The Minister of Oceans and Fisheries shall formulate and implement an ocean waste collection and disposal plan to effectively collect and dispose of wastes discharged or flowing into the sea.</li> <li>• Monetary rewards for reporting of such marine pollution activities, in this case, dumping of waste (from land or sea) into the ocean.</li> </ul>	Collection, storage, transportation	Land- and sea-based
Wastes Control Act	<ul style="list-style-type: none"> <li>• Ensure the proper management of waste and safeguard public health</li> </ul>	Collection, transportation and disposal	General wastes

Korea has adopted the MARPOL Annex V in its Marine Environment Management Act, ensuring ships collect, store, process their wastes in accordance to a waste management plan and keeping a record of these processed wastes.

### 5.2 Sources of Marine Debris

Based on the survey response, Korea's main sources of land-based marine debris are from:

1. Tourism and coastal recreation (most common)
2. Household and general littering
3. Industrial activities
4. Waste management and collection
5. Toilet and sewer overflow (least common)

Korea's main sources of sea-based marine debris are from:

1. Professional and recreational fishing (most common)
2. Aquaculture
3. Shipping sector
4. Port activities
5. Other offshore activities (least common)

### 5.3 Preventive Measures

An initiative, Management Strategy for Marine Plastic Waste, has been established in May 2019, which aims to reduce 50 percent of the current marine plastic volume by 2030. This goal is achieved through establishment of action plans including reduction strategy per source of marine plastic waste, improvement on collection of marine plastic from ships, expedition of processing and recycling of marine plastic, strengthening of foundations for plastic waste management and improvement of social perceptions of marine waste (awareness training). For example, Comprehensive Strategy for Management of Recyclable Waste has been introduced to improve the plan of a product's lifecycle including manufacturing, distribution, collection and recycling.

The main preventive measures implemented include:

1. Restriction on use of plastic packaging (and voluntary reduction of packaging by major distribution company)
2. Prevention of the sale of plastic bags at departmental stores, retail stores, large shopping facilities.
3. Disposable products to reduce waste generated and the collection of garbage from major streams in Korea.

These policies and measures developed by Korea follow a systematic approach, tailoring to local circumstances, considering budget and feedbacks from stakeholders (e.g. experts and environmental groups).

### 5.4 Remedial Measures

The main remedial actions by Korea is beach cleanup and collection of floating wastes from the ocean. These cleanup activities involve the local government, voluntary groups or public institutions. An example is the implementation of coastal cleanup program by the Korea Ocean Environment Management Corporation (KOEM). Debris collected mostly originate from fishery-related activities hence education and awareness raising of the fishers were established. Fishers are also compensated for collecting debris found during fishing or voluntary collection of discarded fishing gear.

Debris collected, comprises mainly of styrofoam, waste fishing net and plastics, that have originated from fishery-related activities. An action plan to educate and improve public awareness of fishers was proposed.

Based on the survey responses, some of the waste management measures that are most relevant (as ranked) to Korea are:

1. Improved cleaning operations in certain areas
2. Promotion of waste collection at the port
3. Improved enforcement on improper disposal into waterways
4. Ban of certain products (e.g. single-use plastics)
5. Awareness raising targeting littering and improper disposal of fishing gear
6. Promote recycling campaigns
7. Voluntary beach clean-up programs
8. Fishing for litter (i.e. picking up litter caught in nets during fishing activities)

9. Redesign of products (e.g. alternative biodegradable materials or reduce the use of non-biodegradable components in the product)
10. Smoking ban or zoning on beaches

## 5.5 Funding & Research

Korea has also provided the Marine Product Development Fund, which has allocated partial funds for marine waste-related purposes. An example of a funded project is the Marine Waste Treatment Project that supports the improvement of fishing grounds productivity in nearby waters.

An ongoing research study on the environmental risk of marine plastic conducted by Korea Institute of Ocean Science and Technology (KIOST) aims to survey domestic pollution caused by marine microplastics and its influence on marine organisms.

## 5.6 Marine Debris Monitoring

Marine debris is monitored as part of beach cleanup activities by various organisations (public or private) and voluntary groups. Details of Korea's marine debris monitoring are provided in [Error! No se encuentra el origen de la referencia.2](#) below.

**Table 12: Marine Debris Monitoring in Korea**

Monitoring Methods	Source Identification Methods	Detailed Description	Findings
Beach cleanup and collection	Visual identification and classification	<ul style="list-style-type: none"> <li>• Monitored by NGO</li> <li>• Location: 40 beaches</li> <li>• Frequency: 6 times a year</li> </ul>	Mainly plastics

The marine debris monitoring revealed many discarded styrofoam buoys leading to the launch of a project to create eco-friendly buoys.

## 5.7 Challenges

The main challenge for Korea on marine debris pollution is the lack of relevant marine debris data (i.e. existing quantity of marine debris). Research efforts have been made to identify the quantity of current marine debris through routes. As a result, concentrated management of areas with large quantities of marine debris (through prediction of movement routes) to improve debris collection rates.

The 5 most relevant gaps on plastic packaging in Korea are as identified in Table 13 below:

**Table 13: Most Relevant Plastic Packaging Gaps in Korea**

Rank	Most relevant gaps in plastic packaging	Explanation
1	Inappropriate behaviour when disposing litter (e.g. during activities along the coast, particularly impact related to tourism, etc.)	Most important factor is increased interest of general public in (and willingness to put into practice) solutions to marine/environmental problems.

Rank	Most relevant gaps in plastic packaging	Explanation
2	Production and consumption patterns based on single-use/disposable items rather than reduce and re-use	Changes in consumption patterns (increase in single-person households, increase in online shopping, etc.), and increase in discarded disposable products due to excessive packaging.
3	Lack of measures to reduce the production of plastic packaging (e.g. bags, bottles, EPS fish boxes)	-
4	Decoupling between design/production and recycling – products are designed without its whole life-cycle in view	-
5	Deficient separate collection infrastructure for plastic packaging waste	-

## 5.8 Opportunities

Direct preventive measures worth considering by Korea and ranked based on the level of priority are:

1. Fishing for litter (Highest priority)
2. Beach clean-up actions
3. Inland clean-up actions
4. Enhanced waste collection on land
5. Better acceptance facilities for ships (Lowest priority)

Indirect preventive measures worth considering by Korea and ranked based on the level of priority are:

1. Legal and Obligations: command and control measures. (Highest priority)
2. Awareness Raising and Information: measures focusing on changing behaviour, labelling and certification, communication, education, training, Inland clean-up actions
3. Subsidies, Taxes and Levies: direct positive and negative economic incentives.
4. Research Oriented Measures: e.g. on prevention, recyclability and biodegradability.
5. Other Economic of Market-based Instruments: green public procurement, purchase specifications, price regulation, costs for goods and services, fee-based systems and trading systems. (Lowest priority)

The main recommendation for APEC economies to collaborate is the standardisation of research methodology and creation of opportunities to present or share model examples.

## 6. NEW ZEALAND

### 6.1 Laws & Regulations

A summary of the waste management laws and regulations in New Zealand is provided in [Error! No se encuentra el origen de la referencia.](#)<sup>14</sup> below.

**Table 14: Waste Management Laws & Regulations in New Zealand**

Laws & Regulations	Brief Description	Waste Management Processes	Sources
Litter Act 1979 Local Government Act 2002	<ul style="list-style-type: none"> <li>Provide a framework and powers for local authorities to decide which activities they undertake and the way they will undertake them; and promotes the accountability of local authorities to their communities</li> <li>General act on litter management</li> </ul>	Collection	Solid wastes from household
Resource Management Act 1991	<ul style="list-style-type: none"> <li>The purpose of the Act is to promote the sustainable management of natural and physical resources</li> <li>Prevent the dumping of wastes in coastal marine area (including from any ship, aircraft or offshore installation)</li> </ul>	Storage, disposal	All wastes
Hazardous Substances and New Organisms Act	<ul style="list-style-type: none"> <li>Purpose of this Act is to protect the environment and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances and new organisms</li> <li>This include wastes (hazardous) which could enter the ocean.</li> </ul>	Storage, treatment, disposal	All wastes
Land Transport Act 1988 Dangerous Goods Act 2005	<ul style="list-style-type: none"> <li>Set out the requirements for the safe transport of dangerous goods on land and in New Zealand</li> </ul>	Transportation	All wastes
Waste Minimisation Act 2008	<ul style="list-style-type: none"> <li>Promote the reduction of waste generation and disposal</li> <li>Impose levy on all wastes disposed at landfill to generate funds for government to minimise wastes</li> <li>Prohibit the sale and manufacture of wash-off products that contain plastic microbeads for the purposes of exfoliation, cleaning, abrasive cleaning or visual appearance of the product.</li> </ul>	Treatment, disposal	All wastes

### 6.2 International Conventions

In general, New Zealand's regulations associated with marine debris prevention include:

- Maritime Transport Act 1994
- Resource Management Act 1991
- Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012
- Resource Management (Marine Pollution) Regulations 1998

- Marine Protection Rules Parts 170 and 180

These implemented legal frameworks are New Zealand's obligations under MARPOL Annex V and LC/LP, to regulate the dumping and discharge including garbage from any ship or offshore installations under New Zealand's jurisdiction.

### 6.3 Preventive Measures

New Zealand has recently implemented the ban on single-use plastic shopping bags, preventing businesses from providing these bags. The ban applies to all new single-use plastic shopping bags with handles that are made of plastic up to 70 microns in thickness. This includes biodegradable, compostable and oxy-degradable plastics bags.

Other preventive measures adopted by New Zealand for land-based marine debris include:

- **Ocean Clean Sweep** – This initiative aims to help operators in the plastics industry to reduce the loss of pellets to the environment. The manual enables operators to audit their own sites and provides advice on establishing procedures to prevent pellet loss into the environment.
- **Well Being Budget** - The Wellbeing Budget provides \$4 million over four years to help the Ministry for the Environment work on improving resource efficiency and shifting New Zealand to a zero-waste economy. It will build on work underway to improve the data on waste, develop mandatory product stewardship schemes for tyres, lithium batteries and refrigerants. The new funding will help implement economy-wide resource recovery work in response to China's waste ban and action on single-use and problem plastics.

### 6.4 Remedial Measures

Some of the remedial measures adopted by New Zealand include the beach and seafloor cleanup activities. For example, Ghost Fishing New Zealand, an international organisation made up of voluntary divers conducts seafloor cleanup. Project Baseline, a charitable organisation, which has a database on cleanup activities allows public document of data before and after cleanup.

Based on survey responses, some of the waste management measures that are most relevant (as ranked) to New Zealand are:

1. Improved enforcement on improper disposal into waterways
2. Phasing-out / Ban of certain items or materials
3. Deposit-refund scheme (e.g. Extended Producer Responsibility)
4. Voluntary phasing-out or minimisation of sale of certain products
5. Promote recycling campaigns
6. Ban of certain products (e.g. single-use plastics)
7. Redesign of products (e.g. alternative biodegradable materials or reduce the use of non-biodegradable components in the product)
8. Voluntary beach clean-up programs
9. Awareness raising for good waste management offshore
10. Promote Green Procurement (e.g. purchasing of products with ecolabels)



New Zealand ensures its policies and measures are aligned with international legislations, taking into considering public consultations and applications to all businesses.

Like other economies, New Zealand's economy to date has been based on a 'take, make and dispose' model, which treats nature and the resources it provides as 'free' and disposable. More materials recovery and local re-processing infrastructure helps us shift to a more sustainable and efficient circular economy, where products are designed to have a long life, and materials can be recovered and easily reused, recycled, remanufactured.

## 6.5 Implications of Marine Debris

New Zealand Environment Committee has considered a briefing on the scale, impact, and sources of plastic pollution in New Zealand's coastal waters, and in it shared about the harmful effects of plastics or microplastics to marine biodiversity, ecosystem and the potential health impact to human.

## 6.6 Funding

The Waste Minimisation Act 2008 imposes a levy on all waste disposed of in landfills to generate funding to help local governments, communities and businesses minimise waste. Half of the levy money goes to territorial authorities (city and district councils) to spend on promoting or achieving the waste minimisation activities set out in their waste management and minimisation plans (WMMPs). The remaining levy money (minus administration costs) is put into the Waste Minimisation Fund. The fund is for waste minimisation activities in New Zealand. For example, two projects that have been funded through the WMF include:

- **Keep New Zealand Beautiful**, a non-profit organisation that focuses on keeping New Zealand communities clean, safe and beautiful. The project increases environmental awareness through a range of sustainability and education programmes. This study is part of a three-year litter prevention project Keep New Zealand Beautiful is undertaking in partnership with the Ministry for Environment. As part of this litter project Keep New Zealand Beautiful is undertaking a comprehensive policy review, implementing an economy-wide litter audit, developing litter specific educational resources for schools and creating an economy-wide litter hub website.
- **Sustainable Coastlines** is a multi-award winning New Zealand charity, whose mission is to enable people to look after the coastlines and waterways they love. The project will roll out a litter education curriculum for schools, establish an economy-wide litter database alongside and bring these programmes to communities around New Zealand. Funded by the Ministry for the Environment's Waste Minimisation Fund, the project also works alongside collaborators from the Department of Conservation and Statistics New Zealand.

Additionally, New Zealand institutions provided numerous funding opportunities for driving innovations in addressing marine debris issues through:

- The Endeavour Fund administered by the Ministry for Business, Innovation and Employment

- National Institute of Water and Atmospheric Research
- Institute of Environmental Science and Research
- The National Science Challenges administered by the Ministry for Business, Innovation and Employment

## 6.7 Marine Debris Monitoring

Marine debris is monitored as part of beach cleanup activities by various voluntary groups in New Zealand and details are provided in **¡Error! No se encuentra el origen de la referencia.**<sup>15</sup> below.

**Table 15: Marine Debris Monitoring in New Zealand**

Monitoring Methods	Source Identification Methods	Detailed Description	Findings
Data collection of beach clean-ups	Local adaptation of the United Nations Environment Program / Intergovernmental Oceanographic Commission Guidelines on Survey and Monitoring of Marine Litter	<ul style="list-style-type: none"> <li>• Sustainable Coastlines have launched a 'Litter Intelligence' database. This is a long-term programme that collects litter data, provides powerful insights about the problem, and inspires widespread action for solutions.</li> <li>• Led by New Zealand charity Sustainable Coastlines, the programme works in close collaboration with the Ministry for the Environment, Department of Conservation and Statistics New Zealand.</li> <li>• Locations: 69 monitoring sites</li> </ul>	Mainly plastics

## 6.8 Challenges

The main challenge for New Zealand on marine debris pollution is the lack of relevant marine debris data to understand the extent of impact and the gaps in materials recovery and waste infrastructure.

The 5 most relevant gaps on plastic packaging in New Zealand are as identified in **¡Error! No se encuentra el origen de la referencia.**<sup>16</sup> below:

**Table 16: Most Relevant Plastic Packaging Gaps in New Zealand**

Rank	Most relevant gaps in plastic packaging
1	Production and consumption patterns based on single-use/disposable items rather than reduce and re-use
2	Lack of measures to reduce the production of plastic packaging (e.g. bags, bottles, EPS fish boxes)
3	Decoupling between design/production and recycling – products are designed without its whole life-cycle in view
4	Lack of awareness or incentives to separate waste for recycling
5	Inappropriate behaviour when disposing litter (e.g. during activities along the coast, particularly impact related to tourism, etc.)

## 6.9 Opportunities

Direct preventive measures worth considering by New Zealand and ranked based on the level of priority are:

1. Eco-design to avoid waste generation or to enhance reuse or recyclability (Highest priority)
2. Enhanced waste treatment chains, avoiding escapes of waste to the environment (e.g. daily covered or better managed landfills)
3. Enhanced waste water treatment
4. Enhanced waste collection on land
5. Better acceptance facilities for ships (Lowest priority)

Indirect preventive measures worth considering by New Zealand and ranked based on the level of priority are:

1. Awareness Raising and Information: measures focusing on changing behaviour, labelling and certification, communication, education, training, Inland clean-up actions (Highest priority)
2. Research Oriented Measures: e.g. on prevention, recyclability and biodegradability.
3. Monitoring: in function of awareness raising, source and loophole detection and further policy planning.
4. Other Economic or Market-based Instruments: green public procurement, purchase specifications, price regulation, costs for goods and services, fee-based systems and trading systems.
5. Legal and Obligations: command and control measures.

The main recommendation for APEC economies to collaborate is to start creating an information repository and build on existing material to develop guidelines or principles where there are gaps.

## 7. PERU

### 7.1 Laws & Regulations

A summary of relevant solid waste management laws and regulations in Peru is provided in table 17 below.

**Table 17: Waste Management Laws & Regulations in Peru**

Laws & Regulations	Brief Description	Waste Management Processes	Sources
Legislative Decree No. 1278	<ul style="list-style-type: none"> <li>• Aim to establish responsibilities of society to use materials efficiently and ensure sound management of waste.</li> <li>• Approves the Law of Integral Management of Solid Waste</li> </ul>	Minimization	Solid wastes;
Law on the integral management of solid waste (Legislative Decree No.	<ul style="list-style-type: none"> <li>• Emphasise the importance of circular economy, recovery and recycling of waste, extended responsibility to the producer, shared responsibility and</li> </ul>	Collection, storage, transportation, treatment, disposal (landfill)	Solid wastes from fishing activity and aquaculture; comprises of hazardous &

Laws & Regulations	Brief Description	Waste Management Processes	Sources
1278 approved this Law and replaced Law N° 27314: General Law of Solid Waste in 2000)	<p>protection for the environment and human health.</p> <ul style="list-style-type: none"> <li>• Waste collection, transportation and disposal by authorized personnel.</li> <li>• Waste storage and disposal by approved facilities</li> </ul>		non-hazardous solid wastes.

Peru has a specific law (Supreme Decree N° 013-2018-MINAM) which promotes the reduction of single-use plastics and responsible consumption of these plastics in entities of the Executive Power (governmental authorities) and one of the solutions is to replace them with reusable plastics. In order to prevent marine debris, a law (Directorate Resolution N° 0766-2003/DCG) approved various provisions to reduce the discharge of waste generated by ships and the waste from the cargo transported to the sea. The Directorate of Maritime Captainty is responsible for monitoring of vessels at sea under jurisdiction of Peru and prevent them from disposal of waste into the sea.

Funding to prevent marine debris is available at the local and provincial level for the management of municipal waste and its disposal.

The Peruvian Marine Research Institute (IMARPE) is conducting research to assess the impact of microplastics on Peruvian coastal species. Preliminary research has identified low level of microplastics in the marine species. Research will continue to evaluate the degree of microplastics contamination, impact to human health and sustainability of the fisheries activities in Peruvian seas.

## 7.2 Land-based Marine Debris Preventive Measures

Based on the survey response, Peru's main sources of land-based marine debris are from:

1. Toilet and sewer overflow (most common)
2. Industrial activities
3. Household and general littering
4. Tourism and coastal recreation
5. Waste management and collection (least common)

For mitigating of marine debris at source, Peru has implemented the Supreme Decree N° 013-2018-MINAM which promotes the reduction of single-use plastics, responsible consumption of plastics in the entities of the executive power and replacing them progressively with biodegradable plastics. The National Service of Natural Protected Areas by the State (SERNANP) has also prohibited single-use plastics in the Historic Sanctuary of Machu Picchu and other Protected Natural Areas.

Land-based marine debris creates a growing concern among the Peruvian population due to the impact of solid wastes that litter the sea and beaches.

One of the remedial measures suggested by Peru for land-based marine debris include raising awareness on the protection of the sea and prevention of marine debris pollution. This should be led by the Peruvian authorities including Ministries, regional, provincial and local governments. Sanctioning measures must also be applied to individuals who violate the law, creating negative impacts on the sea. More severe sanctions may be considered. Peru’s Ministry of Environment should also collaborate with other entities in the environment field, to further develop relevant environmental management to address the marine debris issue. In an example, the Ministry of Production developed a program to clean the seabed at critical places (or hotspots) with marine debris.

### 7.3 Sea-based Marine Debris Preventive Measures

Based on the survey response, Peru’s main sources of sea-based marine debris are from:

1. Offshore industries (most common)
2. Professional and recreational fishing
3. Port activities
4. Shipping Sector
5. Aquaculture (least common)

It should be noted that the above source is ranked partially based on effluent (wastewater) discharge and not entirely on disposal of solid wastes creating marine debris.

Regarding the submarine emissaries installed by the fishing plants for the discharge of their effluents to the marine environment, it is important to note that these effluents have been previously processed through treatment systems installed in the industrial establishments and have been approved in Environmental Impact Studies. The environmental impact study shall be approved by the Ministry of Production, regarding the authorisation of the use of the aquatic area granted by the Directorate of Captaincy and Coast Guard.

Remedial measures for sea-based marine debris include awareness raising on marine protection and preventing pollution. Implementation of surveillance of fishing vessels is suggested to prevent illegal disposal of waste into the sea. Surveillance of beaches should be increased to prevent illegal dumping of rubbish.

### 7.4 Marine Debris Monitoring

The marine debris monitoring method implemented by Peru and its details are provided in **¡Error! No se encuentra el origen de la referencia.**18 below.

**Table 18: Marine Debris Monitoring in Peru**

Monitoring Methods	Source Identification Methods	Detailed Description	Findings
Beach survey (International Coastal Clean Up)	Sorting	<ul style="list-style-type: none"> <li>• Conducted as part of International Coastal Clean Up involving more than 200 public &amp; private institutions supporting the campaign.</li> <li>• Frequency: Annually.</li> <li>• 100 different areas including beaches, rivers &amp; lakes.</li> </ul>	Plastic materials & others

## 7.5 Current Measures on Plastic Wastes

The first measure on plastic wastes taken by Peru is the implementation of laws which promote single-use plastic reduction (as described above Supreme Decree N° 013-2018-MINAM). Governmental entities are encouraged to use biodegradable plastics, and several Peru's Natural Protected Areas have also prohibited the use of single-use plastics. The distribution of the plastic bags to commercial stores and markets was also restricted. The Ministry of Environment of Peru has also launched a website to recognise companies which sell eco-friendly products, plastic alternatives or do not use plastics in their production processes and packaging.

The preventive measures for plastic wastes from marine sources include the surveillance of fishing vessels by Peru's Captaincy Department (preventing illegal disposal) and awareness training for artisanal fishers<sup>10</sup> on proper plastic waste management.

In cases where plastics end up in beaches and the seabed (underwater), clean-up efforts are initiated as a remedial measure.

## 7.6 Challenges & Opportunities

The main challenge with the marine debris issue for Peru is the lack of personnel, resources and financial support for surveillance of illegal waste disposal from vessels at sea and beaches.

The 5 most relevant gaps on plastic packaging in Peru are as identified in **¡Error! No se encuentra el origen de la referencia.**<sup>19</sup> below:

**Table 19: Most Relevant Plastic Packaging Gaps in Peru**

Rank	Most relevant gaps in plastic packaging	Description
1	Inappropriate behaviour when disposing litter (e.g. during activities along the coast, particularly impact related to tourism, etc.)	Awareness training required for people to understand the harmful effects of improper disposal of solid wastes into the ocean.
2	Lack of awareness or incentives to separate waste for recycling	Training required for people to sort solid wastes (esp. plastics) for recycling.
3	Inappropriate behaviour on waste management in industries and retailers (losses of material, etc.)	Awareness training required for people to understand the harmful effects of improper disposal of solid wastes into the ocean.
4	Deficient separate collection infrastructure for plastic packaging waste	None.
5	Inappropriate waste treatment facilities (e.g. landfills close to the coast, etc.)	The competent authority should monitor these facilities.

Direct preventive measures worth considering by Peru and ranked based on the level of priority are:

1. Fishing for litter (Highest priority)

<sup>10</sup> Artisanal fishers are those who use traditional fishing gears and are relatively low-technology for fisheries.

2. Enhanced waste water treatment
3. Eco-design to avoid waste generation or to enhance reuse or recyclability
4. Enhanced waste treatment chains, avoiding escapes of waste to the environment (e.g. daily covered or better managed landfills)
5. Better acceptance facilities for ships
6. Promote research for the use of hydrobiological waste from artisanal fishing and direct human consumption activities. The aim is to obtain useful sub products and generate an additional activity with work opportunities.

Indirect preventive measures worth considering by Peru and ranked based on the level of priority are:

1. Legal and Obligations: command and control measures (Highest priority)
2. Monitoring: in function of awareness raising, source and loophole detection and further policy planning.
3. Research Oriented Measures: e.g. on prevention, recyclability and biodegradability.
4. Awareness Raising and Information: measures focusing on changing behaviour, labelling and certification, communication, education, training and etc
5. Enhanced Enforcement

Peru recommendations for tackling marine debris are establishing regional action plans, guidelines or principles on marine debris prevention and management, and providing training of marine debris specialists.

## 8. SINGAPORE

### 8.1 Laws & Regulations

A summary of relevant solid waste management laws and regulations in Singapore is described in Table 20 below.

**Table 20: Waste Management Laws & Regulations in Singapore**

Laws & Regulations	Brief Description	Waste Management Processes	Sources
Environmental Public Health Act	<ul style="list-style-type: none"> <li>Aim to keep Singapore clean by protecting Singapore's resources from pollution and maintaining a high level of public health.</li> </ul>	Collection, storage, transportation, treatment, disposal (incineration or landfill)	Waste from domestic and trade premises
Environmental Public Health (General Waste Collection) Regulations	<ul style="list-style-type: none"> <li>Cover licensing of General Waste Collector, transportation of different class of general wastes, and disposal of wastes.</li> <li>General waste collection, transportation and disposal must be performed by licensed General Waste Collector.</li> </ul>	Collection, storage, transportation, treatment, disposal (incineration or landfill)	Non-toxic waste from domestic and trade premises
Environmental Public Health (Toxic Industrial Waste) Regulations	<ul style="list-style-type: none"> <li>Cover licensing of Toxic Waste Collector, and collection, transportation and disposal of toxic industrial wastes.</li> <li>Toxic industrial waste collection, transportation and disposal must be performed by licensed Toxic Industrial Waste Collector.</li> </ul>	Collection, storage, transportation, treatment, disposal (incineration or landfill)	Toxic waste from industrial premises
Environmental Protection and Management Act (EPMA)	<ul style="list-style-type: none"> <li>Provide protection for the protection and management of the environment and resource conservation.</li> </ul>	Storage, removal and disposal	Toxic waste from industrial premises

Singapore implements strict regulations which are governed by National Environment Agency (NEA) to ensure that waste is properly managed and disposed. NEA has been encouraging people and industries to reduce their waste, reuse where possible and increase their rate of recycling. Singapore currently has only one active landfill. To conserve the limited landfill space, incineration of waste is necessary to reduce the volume going to the landfill.

The domestic legislation and regulations on pollution control and waste management aim to contribute to the prevention and reduction of marine pollution through (i) management of pollution from land-based sources; (ii) management of water pollution and quality in inland water bodies and coastal areas and (iii) meet the obligations under International Maritime Organization's (IMO) International Convention for the Prevention of Pollution from Ships



(MARPOL), the main international convention covering prevention of pollution of the marine environment by ships.

## **8.2 International Convention**

MARPOL is implemented under the Prevention of Pollution of the Sea Act (PPSA) and its associated regulations, which provide powers to impose fines of up to \$20,000 or imprisonment terms of up to 2 years, or both, for non-compliances with MARPOL. The regulations are applicable to (i) Singapore-registered ships wherever they may be; and (ii) foreign-registered ships in Singapore waters.

Singapore is also a party to the Basel Convention which aims to protect human health and the environment against the adverse effects of hazardous waste by reducing their transboundary movement between economies. Singapore implements the Prior-Informed Consent (PIC) procedure for the transboundary movement (i.e. export, import and transit) of hazardous wastes and other wastes that are controlled under the Basel Convention. Singapore implements the obligations of the Convention through the Hazardous Waste (Control of Export, Import and Transit) Act and Hazardous Waste (Control of Export, Import and Transit) Regulations. Companies importing, exporting or transiting hazardous waste, are required to apply for a Basel Permit from NEA (Pollution Control Department, PCD) with the necessary supporting documents.

## **8.3 Land-based Marine Debris Preventive Measures**

Given Singapore's comprehensive and integrated solid waste management and collection system to minimise waste at the source and collect all waste for proper disposal, the amount of waste that is washed into the marine environment is not significant.

Singapore has a comprehensive and integrated solid waste management and collection system to minimise waste at the source and collect all waste for proper disposal so that waste will not be washed into the marine environment. All other incinerable wastes that are not segregated at source for recycling are disposed of at waste-to-energy (WTE) plants fitted with modern flue gas treatment systems to remove pollutants. Ash from the WTE process, together with other non-incinerable wastes, are disposed of at the off-shore Semakau Landfill.

Singapore government adopts a multi-prong strategy (prevention, legislation and enforcement, monitoring and education) for environmental management. Industries are required to comply with the relevant NEA's environmental regulations as listed in Section 3.17.1.

Singapore has a strict anti-littering enforcement regime, with first-time littering offenders being issued a \$300 monetary penalty. There are heavier penalties for recalcitrant offenders who are prosecuted in court, including fines up to \$10,000 and/or Corrective Work Orders, which require the offender to pick litter at public areas for a period of time. This enforcement regime aims to deter littering.

There is a routine cleaning regime put in place for all inland waterways to remove land-based litter and flotsam by NEA. Vertical gratings, litter traps and float booms have also been installed where appropriate as part of the drainage network to trap debris and litter. In any case, two-thirds of Singapore is a water catchment area and the drains and canals lead to a reservoir

instead of the open sea. For waterways that lead to the sea, the aforementioned cleaning regime and litter traps prevent litter from flowing out into the sea.

Singapore is fostering ownership through cooperation with environmental groups such as the Public Hygiene Council (PHC), International Coastal Cleanup Singapore (ICCS) and the Waterways Watch Society (WWS).

#### 8.4 Sea-based Marine Debris Preventive Measures

Ship-based pollution in Singapore is covered under MARPOL obligations and Singapore has a small commercial fishing and aquaculture industry.

Singapore has strict regulations that forbid any debris from being discarded into watercourses and the marine environment. For example, discharge from the marine outfalls of the Water Reclamation Plants and Desalination Plants is not allowed to contain debris or flotsam. Any debris found in used water or seawater is mechanically screened and removed upstream and disposed by incineration.

In addition, Singapore conducts inspections on both Singapore-registered ships and foreign-registered ships in Singapore’s port to ensure that they comply with the regulations on garbage disposal and that anti-pollution measures are in place. Ships are also required to maintain garbage records and management plans for verification by inspectors. As part of MARPOL obligations, the Maritime and Port Authority of Singapore (MPA) deploys garbage collection crafts daily at scheduled timings to collect garbage from ships at the anchorages. No additional fees are collected from ships for disposal of garbage unless special requests to dispose garbage at a specific timing and location are made, in which case a fee is charged. Further, MPA’s Port Inspectors patrol Singapore’s port waters to ensure that ships in the Port of Singapore do not illegally discharge waste, oil, garbage and sewage. To enhance the effectiveness of patrols, the fleet of Next-Generation Patrol Craft is equipped with enhanced surveillance and response capabilities.

#### 8.5 Marine Debris Monitoring

The marine debris monitoring method implemented by Singapore and their details are provided in Table 21 below.

**Table 21: Marine Debris Monitoring in Singapore**

Monitoring Methods	Source Identification Methods	Detailed Description	Findings
NUS-NParks Marine Debris Monitoring Programme	Derived from literature review of publications (e.g. UNEP/IOC Guidelines on Survey and Monitoring of Marine Litter, Australian Marine Debris Initiative, GESAMP reports)	<ul style="list-style-type: none"> <li>• When: Between December 2017 to February 2019</li> <li>• Frequency: Six sites were monitored every two months for 15 months.</li> <li>• Who: Public volunteers, schools, corporate groups, government agencies, and other organised groups</li> <li>• Where: Six beach locations (Lim Chu Kang, Selimang Beach, Pasir Ris Beach, Pulau Ubin, Tanah Merah)</li> </ul>	The data is currently being analysed.

Monitoring Methods	Source Identification Methods	Detailed Description	Findings
		Beach, Small Sister's Island) in Singapore	
International Coastal Cleanup (Singapore)	Ocean Conservancy's International Coastal Cleanup data card	<ul style="list-style-type: none"> <li>• When: Every September since 1992</li> <li>• Frequency: Annually</li> <li>• Who: Public volunteers and organised groups</li> <li>• Where: 53 coastal locations in Singapore</li> </ul>	Top three common items in 2018 are foam pieces, cigarette butts, plastic pieces, beverage bottles (plastic) and straws/stirrers. <sup>11</sup>
Singapore Reefs' Dive Cleanups – Project AWARE	Project AWARE's Dive Against Debris data card	<ul style="list-style-type: none"> <li>• When: Since 2017</li> <li>• Frequency: Quarterly</li> <li>• Who: Dive volunteers</li> <li>• Where: Southern Islands of Singapore (i.e. Lazarus Island and Sisters' Islands Marine Park)</li> </ul>	The most common material collected is plastics (57%), followed by metal (15%), glass and ceramics (5%). Top three plastic items collected are bottles, food wrappers and cutlery.
Establish baseline data on marine debris	Research on macro-debris and microplastics	<ul style="list-style-type: none"> <li>• There is an ongoing research collaboration with the National University of Singapore to establish baseline data on marine debris in Singapore's shores, develop a citizen-science programme to monitor macro-debris and microplastics and facilitate dialogue with stakeholders towards recommendations for management approaches.</li> </ul>	In the progress

## 8.6 Current Measures on Plastic Wastes

Singapore uses a holistic 3R (Reduce, Reuse, Recycle) approach to manage plastic and packaging waste. The objective is to reduce excessive use of all disposables, including single-use plastics, and to achieve an overall recycling rate of 70% by 2030 with the participation of all sectors including public, private and people.

Starting with upstream reduction, the Government, industry and non-government organisations (NGOs) jointly launched the Singapore Packaging Agreement (SPA) in 2007 to reduce packaging waste. Since its inception, SPA signatories have cumulatively reduced about 54,000 tonnes of packaging waste. To build on the foundation of the SPA, Singapore will be introducing mandatory reporting of packaging data, including plastics, and 3R (reduce, reuse and recycle) plans for packaging in 2020. This also builds on an existing mandatory waste reporting framework for large malls and hotels, which will be expanded to all large industrial and commercial premises, including large convention and exhibition centres, in 2020. The mandatory packaging reporting framework will also lay the foundation of an Extended Producer Responsibility (EPR) framework for managing packaging waste including plastics.

<sup>11</sup> <http://coastalcleanup.nus.edu.sg/results/2018/2018.htm>

This ensures producers are responsible for the collection and recycling of the materials they use to package their products. The aim is to have the EPR system for packaging waste management in place by 2025.

The government also supports ground-up initiatives on reducing packaging use through funding support. One such initiative was NGO - Zero Waste SG's Bring Your Own (BYO) campaign, aimed at encouraging consumers to use reusable bags and containers when they buy takeaway food, beverages and groceries. Since 2017, more than 400 retail outlets have joined the campaign, providing incentives to customers who bring their own reusables. This has saved approximately two million pieces of plastic disposables and packaging. Leveraging the success of BYO, the government also supported Zero Waste SG with the Partnership Fund to further develop the campaign in 2019 into Bring Your Own Bag (BYOB) to focus on reducing disposable plastic bag usage.

To encourage residents to recycle, all residential premises have convenient access to recycling services, including the collection of plastic recyclables, through the National Recycling Program. Recyclables including plastics are collected through a commingled system, then sorted, baled and sent for recycling.

Singapore's approach has been to reduce the excessive use of all types of disposables, not just single-use plastics, and to promote the use of reusables. Singapore does not target plastics alone, as this may simply result in their substitution by other types of materials which are not necessarily better for the environment. To encourage consumers to reduce the use of disposables, the NEA launched the "Say YES to Waste Less" campaign in 2019 as part of the Year Towards Zero Waste movement. 59 partners operating over 1,600 premises ranging from food and beverage establishments, supermarkets, and hotels have come forward to partner the NEA in this economy-wide endeavour.

## 8.7 Challenges & Opportunities

The challenges with marine debris issue for Singapore have been identified in the table below:

**Table 22: Key Challenges in Tackling Marine Debris Issues in Singapore**

Challenges	Measures	Effectiveness
Ensuring proper solid waste management	Environmental Protection and Management Act (EPMA) and the Environmental Public Health Act (EPA).	Effective
Controlling discharges into waterways	Environmental Protection and Management Act (EPMA) and the Environmental Public Health Act (EPA).	Effective

Singapore is developing the local recycling industry to better extract resources from waste and close the waste loop domestically. NEA is currently studying recycling solutions and technologies and assessing their suitability for adoption in Singapore. For example, mechanical recycling to turn waste plastics into plastic pellets for manufacturing new products, or chemical recycling to turn plastic waste into chemical feedstock or fuel. These are efforts which would help transform the Environmental Services industry, creating new opportunities that will grow local enterprises and provide better jobs for Singaporeans.

The main recommendation for APEC economies is to consider encouraging economies to strengthen their waste management systems as well as increase the percentage of wastewater

treated. This will help minimise waste at the source and the amount of waste discharged into the ocean.

## 9. CHINESE TAIPEI

### 9.1 Laws and Regulations

Table 23 highlights some laws and regulations in place to deal with waste and marine debris in Chinese Taipei.

**Table 23: Laws & Regulations associated with Waste Management & Marine Debris in Chinese Taipei**

Laws & Regulations	Brief Description	Waste Management Processes	Sources
Compulsory Garbage Sorting Policy <sup>12</sup>	<ul style="list-style-type: none"> <li>Household waste is required to be first sorted in three categories (recyclables, food leftovers and general household waste) before they are accepted for disposal</li> </ul>	Disposal	Household waste
Fishing Harbour Act	<ul style="list-style-type: none"> <li>Prohibit the discharge of litter to the harbour areas</li> </ul>	Disposal	Fishing waste
Commercial Port Act	<ul style="list-style-type: none"> <li>Regulate waste discharge at Port Reception Facilities</li> </ul>	Disposal	Waste from ships
Marine Pollution Control Act	<ul style="list-style-type: none"> <li>Control marine pollution</li> <li>Protect the marine environment</li> <li>Maintain the marine ecology</li> <li>Safeguard public health</li> <li>Sustainably use marine resources</li> </ul>	Disposal	Any waste
Waste Disposal Act	<ul style="list-style-type: none"> <li>Regulate the collection, storage, transportation, treatment and disposal of waste.</li> </ul>	Collection; Storage; Transportation; Treatment; and Disposal	Household and Industrial waste

### 9.2 Preventive and Remedial Measures

Among the measures that are most relevant to an organisation, Chinese Taipei identified that the most relevant was promoting recycling campaigns, banning certain products (e.g. single use plastics) and providing deposit refund schemes (e.g. extended producer responsibility). The least relevant was voluntary phasing out or minimisation of sale or use of certain products and the phasing out of certain items or materials.

Some regulations enforced include Chinese Taipei's Environmental Protection Administration (EPA) and environmental NGOs whom have worked together to introduce the "Marine Debris Governance Platform". It aims enhance social collaboration and participation, research, source reduction as well as waste prevention and removal. Under this platform, it has monitored marine debris, funded cleans ups, encouraged fisherman to remove marine debris and properly dispose waste amongst others.

As part of its preventive measures it has undertaken strategic research projects that have included monitoring marine debris, evaluating micro plastic pollution in salt and researching on micro-plastics and its effect on biology and ecology.

<sup>12</sup> <http://www.taipeitimes.com/News/taiwan/archives/2004/12/20/2003215926>

### **9.3 Land-Based Marine Debris Preventive Measures**

In a survey conducted on the main sources of marine debris in Chinese Taipei, the economy identified the largest offender to be the tourism industry and coastal recreation specifically from plastic bottles followed by fishery waste.

Chinese Taipei has attempted to prevent debris through several initiatives which include:

- Banning or restricting the use of plastic items (e.g. ban of micro beads and straw)
- Promoting non-plastic on remote islands (e.g. adding recycling stations at Xiao Liuqiu island)
- Restricting commercial over packaging (e.g. cosmetics, cakes)
- Promoting the green mark in hotels on outlying islands

### **9.4 Land-Based Marine Debris Remedial Measures**

To prevent debris from entering the ocean, Chinese Taipei has carried out several measures which include:

- Intercepting waste from the river
- Promoting the environmental education
- Promoting the recycling of plastic containers
- Removing trash from remote islands
- Inspecting landfill sites
- Cleaning beaches

These measures were found to be effective. For instance, through beach cleaning in the last 10 years more than 65,177 tonnes of trash had been collected from beach cleaning. In the same vein, the inspection of land fill sites have not revealed any spilled trash from the river.

### **9.5 Sea-Based Marine Debris Preventive Measures**

In a survey conducted, Chinese Taipei reported the following to be the main sources of marine debris (listed with the top being the most relevant)

- Port activities
- Fishing (professional and recreational)
- Aquaculture
- Shipping sector
- Other offshore industries (oil etc.)

To prevent sea-based marine debris it has introduced the Marine Pollution Control Act to: (1) control marine pollution; (2) maintain the marine ecology; (3) safeguard public health; and (4) sustainably use marine resources.

### **9.6 Sea-Based Marine Debris Remedial Measures**

Chinese Taipei has carried out initiatives to identify marine debris hotspots, fund local governments to clean up marine debris, encourage fishing vessels to clean up floating marine waste and encourage volunteers to assist in underwater waste removal.

To ensure these regulations have their predicted impact, the Chinese Taipei government has provided incentives or penalties to increase participation in debris removal. For instance, under the fisher harbour act, it prohibits the discharge of litter to harbour areas. Also, the Commercial Port Act regulates water discharges at port reception facilities.

### **9.7 Current Measures on Plastic Wastes**

When asked to rank direct measures to deal with marine litter, Chinese Taipei ranked the following (listed below in terms of order):

- Enhanced waste collection on land
- Beach clean-up actions
- Fishing for litter
- Better acceptance facilities for ships
- Inland clean-up actions

For the case of indirect measures, it identified legal and obligations as the highest priority followed by awareness raising and information, enhance enforcement, research oriented measures and other economics of market based instruments.

### **9.8 APEC's role in Marine Debris**

Chinese Taipei believes tackling marine debris requires a concerted response by more than one economy. It suggests that a new international instrument has to be established to target the plastic marine litter problem. Additionally, there is a need to enhance participation and cooperation of economies with regards to international or regional initiatives.



## 10. UNITED STATES

### 10.1 Laws and Regulations

Table 24 illustrates the laws and regulations in place in the United States with regards to Marine Debris.

**Table 24: Laws & Regulations associated with Waste Management & Marine Debris in the United States**

Laws & Regulations	Brief Description	Waste Management Processes	Sources
The Resource Conservation and Recovery Act (RCRA)	<ul style="list-style-type: none"> <li>• Introduce a framework for the management of non-hazardous solid wastes</li> <li>• Set minimal technical standards for the design and operation of disposal facilities</li> </ul>	Collection; Storage; Transportation; Treatment; and Disposal	Municipal Solid Waste
Solid Waste Disposal Act	<ul style="list-style-type: none"> <li>• Set minimal economy-wide criteria for solid waste facilities</li> </ul>		
Save our Seas Act	<ul style="list-style-type: none"> <li>• Reauthorise NOAA Marine Debris Program till 2022</li> <li>• Reduce marine debris through research, prevention and reduction</li> <li>• Also allow for federal agencies to work internationally with other economies</li> </ul>	Disposal	Any waste

### 10.2 International Conventions

The United States has ratified several international conventions which include:

- MARPOL Annex V: Has been incorporated into the United States under 33 CFR § 158.410
- London Convention: Has been ratified and implements the regulation under the Marine Protection, Research and Sanctuaries Act (MPRSA).
- Land-Based Sources (LBS) Protocol to the Cartagena Convention for the wider Caribbean: Marine debris is one of the priority pollutants listed in the protocol.

### 10.3 Preventive and Remedial Measures

When asked about measures that are most relevant, the United States ranked the following as one the most important (ranked from most important to least):

- Promote recycling campaigns
- Voluntary beach clean-up programs
- Voluntary phasing-out or minimisation of use of certain products
- Awareness raising in specific sensitive areas or targeting specific items

Initiatives undertaken to tackle marine debris have included the NOAA Marine Debris Program (MDP) which aims to investigate and prevent the detrimental effects of marine debris through prevention, research, removal, regional coordination and emergency response. Some examples of initiatives that it supports includes emergency response planning efforts and coordinating with partners during an acute marine debris event.

Additionally, the United States Environmental Protection Agency has promoted its Trash Free Waters Program. The initiative works with a variety of stakeholders to identify problems and prioritise low tech, low cost solutions to prevent and reduce marine litter and debris.

#### 10.4 Good Regulatory Practices

The United States indicated that the use of goods regulatory practices has been include in the following areas:

Good Regulatory Practices	Description
Standards	<ul style="list-style-type: none"> <li>• Minimum criteria for solid waste facilities have been established</li> <li>• Facilities that do not meet the criteria are required to be closed</li> </ul>
Flexibility	<ul style="list-style-type: none"> <li>• There is a degree of flexibility that allows States to set more stringent requirement as long as the federal criteria is met</li> </ul>
Efficiency	<ul style="list-style-type: none"> <li>• To increase efficiency, States modify their funding mechanisms to support their solid waste disposal and diversion programs</li> </ul>
Monitoring and Evaluation	<ul style="list-style-type: none"> <li>• The Environmental Protection Agency (EPA) published fact and figures report which includes economy-wide data on generation, recycling, composting, combustion with energy recovery and landfilling.</li> </ul>
Stakeholder Consultation	<ul style="list-style-type: none"> <li>• The EPA facilitates communication and collaboration with stakeholders, developing economy-wide guidelines, best practices and technical support to manage materials and waste.</li> </ul>

#### 10.5 Funding and Research

Funding in the United States has been provided through NOAA for local level activities. Under this mechanism, projects are generally awarded on a two-year cycle but others may be through grant competitions and potentially more long term. In 2018 alone, NOAA has provided \$1.1 million in funding through 11 grant awards.

Apart from initiatives, NOAA also funds research in the areas of understanding the fate and transport of debris, species impact of debris and impact to coastal and marine habitats. It allocated \$1.2 million to research projects in 2019.

#### 10.6 Land-Based Marine Debris Preventive Measures

When mitigating land-based marine debris at its source, the United States has carried out measures that include:

- Public participation: NOAA creates material to increase awareness on the issue among the public and offers suggestions on how they can do their part to improve it.
- Fishing for Energy Partnership: As a partnership between the NOAA, Covanta, the National Fish and Wildlife Foundation (NFWF) and Schnitzer Steel industries, the initiative aims to prevent and reduce the impact of derelict fishing gear in the marine

environment. Without any cost, the initiative converts old or unwanted fishing gear into energy.

- EPA Urban Waters Federal Partnerships: improves coordination among federal agencies and provides small grants to protect waterways. Much of the grants are directed towards trash capture and urban water management.

## **10.7 Land-Based Marine Debris Remedial Measures**

The United States has ranked the most common sources of land-marine debris as litter in storm water runoff as well as household and general littering. Tourism and coastal recreation, toilet and sewer overflow, as well as waste management and collection are the least common sources of debris.

In response to these debris, the United States has created the NOAA prevention project fund, introduced state and local laws or ordinances and initiated projects such as the Trash Free Waters. Additionally, the EPA also supports marine litter initiatives such as the use of trash capture devices to clear trash in water and facilitate its removal within streams and rivers. It aims to use these removal projects to both clean up shorelines and coastal areas as well as to educate the public.

## **10.8 Sea-Based Marine Debris Remedial Measures**

For the case of sea-based marine debris, the main source was found to be the shipping sector followed by fishing and aquaculture.

To tackle these issues, NOAA partners with industry and Fishing for Energy to enable the fishing industry to dispose retired or discarded fishing gear. Since 2008, it has collected over 4 million pounds of fishing gear through 52 collection bins at several ports in the United States. More than 1000 fisherman have participated in retrieving nets in the ocean. Additionally, grants have also been provided to remove fishing gear from coastal waters in the United States.

## **10.9 Monitoring of Marine Debris**

To better monitor marine debris, the United States has introduced:

- NOAA Shoreline Monitoring Field Guide
- NOAA Marine Debris Monitoring and Assessment Project: an initiative that compiles the amount and type of debris in the environment. It hopes that through such monitoring it will be able to identify targets for future mitigation efforts.
- Micro plastic monitoring: provides sediment trawl and water column sampling
- EPA Escaped Trash Assessment Protocol (ETAP): provides a methodology to identify clean-up sites, track clearing and cataloguing to produce data of the characteristics of trash

These monitoring efforts allow for the amount and type of debris to be recorded such that marine debris can be tracked, prevented and future targets can be identified.

### **10.10 Current Measure on Plastic Wastes**

The United States identified 5 direct measures based on their priority. Their rankings are as follows:

- Enhanced waste collection on land
- Enhanced waste treatment chains, avoiding escapes of waste to the environment
- Beach clean-up actions
- Eco-design to avoid waste generation or to enhance reuse of recyclability
- Enhanced waste water treatment

For the case of indirect measures, the United States identified 5 indirect measures as listed below:

- Awareness raising and information
- Research oriented measures
- Monitoring
- Enhanced enforcement
- Other Economic of Market Based Instrument

### **10.11 APEC's role in Marine Debris**

The United States has identified that APEC could potentially serve as a convenor for the region in compiling challenges that economies face with regards to marine litter and debris. It identifies that there is yet to be a regional body collecting such information in the Asia-Pacific region.

Additionally, it suggests that APEC could coordinate its efforts with other entities such as Circulate Capital and Ocean Conservancy. To do this, APEC could build stronger partnerships with private and business sectors.