



Ministry of Sustainability
and the Environment
— SINGAPORE —

NATIONAL ACTION STRATEGY

ADDRESSING MARINE LITTER IN SINGAPORE

CONTENTS

1. Marine Litter – A Global Problem	1
2. Singapore’s Context	3
2.1 Marine and Coastal Landscape	3
2.2 Marine Litter Policy Landscape	4
3. Principles	4
4. Priority Areas and Measures	5
4.1 Reduction of Land-Based Sources of Litter	5
4.1.1 Control of waste collection and disposal	5
4.1.2 Integrated solid waste management system	5
4.1.3 Treatment of all wastewater before discharge to sea	7
4.1.4 Waterway and coastal clean-up	7
4.1.5 Regulating general waste disposal facilities	8
4.2 Reduction of Sea-Based Sources of Litter	8
4.2.1 Inspections on ships	8
4.2.2 Offshore fish farms	9
4.2.3 Cleaning of coastal waters	9
4.2.4 Implementation of MARPOL	9
4.3 Circular Economy Approach	11
4.3.1 Reducing the use of disposables	11
4.3.2 Promoting recycling	12
4.3.3 Legislations	12
4.4 Research and Development	13
4.4.1 Membrane bioreactor (MBR) technology systems at water reclamation plants	13
4.4.2 NUS-NParks Marine Debris Study	13
4.4.3 Use of technology	14

CONTENTS

4.5 Promoting and Strengthening Outreach and Stakeholder Engagement	16
4.5.1 People, Private and Public (3P) Partnerships	16
4.5.2 Raising awareness through collaboration with ground-up initiatives	16
4.5.3 Engaging citizens to co-create solutions	17
4.5.4 Community initiatives	17
4.5.5 Educating youths	17
4.6 International Engagement and Collaboration	18
4.6.1 International and regional platforms	18
4.6.2 Other cooperation	18
5. Looking Ahead	19
Annex A: List of Community Initiatives	20
Annex B: References	22

CREDITS:

Ministry of Education
Ministry of Foreign Affairs
Ministry of National Development
Ministry of Sustainability and the Environment
Ministry of Transport
Maritime and Port Authority of Singapore
National Environment Agency
National Parks Board
PUB, Singapore's National Water Agency
Singapore Food Agency
Singapore Land Authority

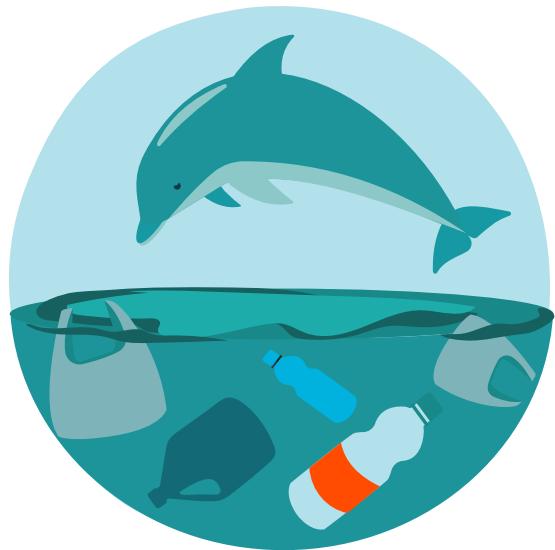
01

Marine Litter – A Global Problem

Marine litter, sometimes referred to as marine debris, is defined as “any persistent, manufactured, or processed solid material that is discarded, disposed of or abandoned in the marine and coastal environment.”¹ It comes in many forms and includes plastic bags, glass, wood and tyres. Marine litter comes from many sources, and is moved across the oceans by prevailing winds and tides. Globally, 80% of marine litter comes from land-based sources, particularly landfills, rivers and floodwaters, industrial outfalls, discharge from storm water drains, untreated municipal sewerage, and littering of beaches and coastal areas.² Rapidly increasing levels of marine litter, including plastic litter and microplastics, are a serious environmental problem on a global scale.

Plastics are considered the most persistent and problematic of the different types of marine litter.³ More than 150 million tonnes of plastic are estimated to have been dumped in the world’s oceans, with about 8 million tonnes added every year. These plastics can take hundreds of years to biodegrade completely. The buoyant characteristic of plastic litter, combined with its slow biodegrading nature, leads to tremendous dispersal potential in our oceans.

In addition, when weathered and fragmented, larger plastic objects become microplastics, which are operationally defined as small particles or fragments measuring less than 5 millimetres in diameter.⁴ These



microplastics are easily ingested by marine creatures and can potentially cause harm to human and environmental health.⁵

Marine litter poses environmental, economic, health, cultural and aesthetic threats, including the loss of biodiversity and degradation of marine and coastal habitats and ecosystems. Marine wildlife such as whales, turtles, seabirds, and crustaceans are especially vulnerable to marine plastic litter as it disrupts their digestion and causes physical lacerations and entanglement. Floating plastics contribute to the spread of invasive organisms that can disrupt ecosystems. Marine plastic litter can leach chemicals used in its production and pose a

¹ United Nations Environment Programme, 2004.

² Jambeck et al., 2015; United Nations General Assembly, 2004, para. 97.

³ Based on International Coastal Clean Up, the most common types of marine plastic litter are cigarette butts, food wrappers, plastic bottles, bottle caps, grocery and plastic bags, straws and stirrers, and Styrofoam and plastic containers.

⁴ Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP), 2015.

⁵ United Nations Environment Programme, 2017.

threat to human health. Litter on coasts also affects the aesthetic value of tourist destinations leading to decreased tourism-related income, and major financial costs related to the cleaning and maintaining of coasts.

Marine litter is also a transboundary issue. It is transported across seas through ocean currents and waves. One example is the Great Pacific Garbage Patch of marine litter from around the world.

A 2011 United Nations Environment Programme Report stated that marine litter has been found even in the most remote places on Earth with few or no humans present, such as on St Brandon's Islands in the Indian Ocean.⁶ In Singapore, we have also seen

increased landings of marine litter on our shores during the monsoon season.

It is thus imperative that the issue of marine litter is addressed through collective and coordinated action on a national, regional, and global level, in line with Target 14.1 of the Sustainable Development Goals (SDGs).⁷

As a responsible global citizen, Singapore recognises our role in contributing to the collective response to tackling marine litter and microplastics. This National Action Strategy aims to summarise and outline Singapore's various actions and measures to combat the issue of marine litter.



Marine litter on the beach

⁶ Scientific and Technical Advisory Panel, 2011.

⁷ Target 14.1 aims to, by 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities.

02

Singapore's Context

MARINE AND COASTAL LANDSCAPE

Singapore is a small and heavily urbanised island-state in Southeast Asia situated at the southern tip of the Malayan Peninsula between Malaysia and Indonesia. Located between the Indian Ocean and the South China Sea, Singapore is bordered on the north by the narrow Johor Strait, which separates it from Peninsular Malaysia, and on the south by the Singapore Strait. The Johor Strait is divided into East and West Johor Straits by the Singapore-Malaysia causeway. The Strait receives water mainly from Sungai Johor and Sungai Pulai, both located in Malaysia. Biogeographically, Singapore is enclosed between two of the largest marine ecoregions of the world – the Western Indo-Pacific and Central Indo-

Pacific regions⁸ – and additionally sits near the Coral Triangle. While Singapore is one of the smallest countries in the world with a total land area of 728 square kilometres (as of 2020) and a 511-kilometre coastline, our waters and coastline harbour relatively rich marine biodiversity. They are home to 12 of the 23 species of Indo-Pacific seagrass, 31 true mangrove plant species (two-thirds of that in Asia), over 250 species of hard corals (a quarter of the world's 800 species), over 200 species of sponges, over 60 species of echinoderms, over 50 species of sea anemones and many other species of marine plants and animals.



Map of Singapore

⁸ Spalding, et al., 2007

MARINE LITTER POLICY LANDSCAPE

In 2020, Singapore established the Interagency Taskforce on Marine Litter, to coordinate and implement marine litter policies across our government agencies. The Ministry of Sustainability and the Environment chairs the Taskforce, which consists of nine agencies. The National Environment Agency (NEA) and the National Parks Board (NParks) provide technical support to the Taskforce, including through research projects and studies.

03

Principles

The challenge of marine litter is a multifaceted one, and each country has its own unique circumstances. Any approach to reduce marine litter must be tailored specifically to the needs of the country and local geographies, with no ‘one size fits all’ solution. Furthermore, the complexity of the marine litter challenge means that a whole of nation approach is needed, to ensure we can tackle the issue holistically. This entails working closely with stakeholders from various sectors to understand the issue and develop solutions together, in order to bring about the enduring and sustainable changes needed to reduce and prevent marine litter.

As the largest quantity of marine litter entering oceans in the region stems from land-based sources, it is imperative to focus on waste reduction and waste management. Singapore is committed to addressing both land-based and sea-based sources of marine litter through the measures outlined in this National Action Strategy, which is guided by the core principles of sustainable development and a circular economy approach, and supports the 2030 Agenda for Sustainable Development, such as SDG 14.1.



The priority areas for the National Action Strategy are as follows:

- I. Reduction of Land-Based Sources of Litter
- II. Reduction of Sea-Based Sources of Litter
- III. Circular Economy Approach
- IV. Research and Development
- V. Maintaining and Strengthening Outreach and Stakeholder Engagement
- VI. International Engagement and Collaboration

The National Action Strategy will be reviewed, to ensure that Singapore adapts quickly to new circumstances and opportunities, in line with collective global, regional and national imperatives. The following section broadly outlines the various policy actions which seek to address the issue of marine litter both internationally and domestically.

04

Priority Areas and Measures

REDUCTION OF LAND-BASED SOURCES OF LITTER

Globally, land-based waste is the largest source of marine litter. To minimise waste and prevent discharge of litter into the sea, countries need to reduce and prevent land-based sources of marine pollution through stringent regulations on pollution control and waste management.

Countries also need to put in place a comprehensive waste and water management system to prevent leakage of such waste into the seas and ocean.

4.1.1 Control of waste collection and disposal

Through the Environmental Public Health Act (EPHA), NEA ensures there is a comprehensive and integrated waste collection and management system in Singapore. All waste from municipal, commercial and industrial sources in Singapore are collected for disposal or recycling.

NEA also controls the discharge of trade effluent, oil, chemical, sewage or other polluting matters into drains, as well as hazardous substances into inland waters. The EPHA also includes strict anti-littering regulations.

4.1.2 Integrated solid waste management system

All incinerable waste including plastics that are not segregated at source for recycling are collected and disposed of at waste-to-energy (WTE) plants.

These WTE plants are fitted with modern air pollution control systems such as flue gas treatment systems to ensure that flue gases are treated to meet local air emission standards. Ash from the WTE process, together with other non-incinerable wastes, are disposed of at the off-shore sanitary Semakau Landfill.⁹ This integrated solid waste management system ensures the proper collection and treatment of all solid wastes, and prevents waste, such as plastic, from entering the ocean.



⁹ Monitoring wells are provided along the 7 kilometre-long perimeter bund of Semakau Landfill for water sampling to ensure that water quality meets the Environmental Protection and Management (Trade Effluent) Regulations, leachate is contained within the landfill and the surrounding sea water quality is not compromised.

SEMAKAU LANDFILL

Located 8 kilometres south of mainland Singapore, the sea space between two close lying islands, Pulau Semakau and Pulau Sakeng, has been enclosed by a 7-kilometre perimeter bund lined with impermeable membrane, clay, geo-fabric and rock protection to form Semakau Landfill. Construction for the offshore landfill began in 1995 to address the competing need for land on the main island and Singapore's increasing landfilling needs. Today, the 350-hectare landfill is the only operating landfill in Singapore, and is unique as it coexists with a vibrant marine eco-system, mangroves, grassland and shoreline habitats.

For more information on Semakau Landfill, please visit:

https://www.towardszerowaste.gov.sg/semakau_landfill



4.1.3 Treatment of all wastewater before discharge to sea

PUB, Singapore's National Water Agency, ensures all used water is collected and treated at water reclamation plants (WRPs) to internationally recognised discharge standards. During the treatment process, microplastics, which include microbeads, are removed as sludge and incinerated. PUB is planning to extend the use of membrane bioreactor (MBR) technology systems at its WRPs to enhance its water treatment process, which would further reduce the discharge of microplastics into the sea.



Cleaning at litter trap



Cleaning of waterway

4.1.4 Waterway and coastal clean-up

Singapore has a range of waterway clean-up measures that prevent litter or plastic waste, regardless of source, from being washed into the ocean. Litter that enters our waterways is caught by litter traps installed at appropriate locations and expediently removed by flotsam removal craft. In addition, marine litter that washes onto our recreational beaches and coastlines are removed by NEA and other government agencies, regardless of litter sources. NEA also cleans the recreational beaches and coastlines under its purview regularly with frequencies ranging from four times a week to once in two weeks, depending on public usage and accessibility to the beach.



Flotsam removal craft



Litter trap at waterway



In 2020, NEA collected over 1,300 tonnes of flotsam from the beach at East Coast Park, of which about 58% was collected during the Southwest monsoon months. During those months, the amount of flotsam collected from the beach is around 2.7 times more than the non-monsoon period. In total, NEA collected 3,485.7 tonnes of marine litter from the recreational beaches and coastlines that it cleaned. Community groups play a significant role in Singapore's efforts to clean up our waterways and coasts. Ground-up community groups frequently organise initiatives and clean-up activities around Singapore to contribute to keeping the nation clean, raise awareness on the global marine litter problem, and to encourage the public to adopt more sustainable practices. More information on community initiatives can be found in Annex A.

4.1.5 Regulating general waste disposal facilities

NEA regulates general waste disposal facilities through the EPHA, the Environmental Public Health (General Waste Disposal Facility) Regulation 2017 and the Environmental Public Health (General Waste Disposal Facility – Exemption) Regulations 2019. Licensees must ensure that their maintenance and operations of their licenced GWDF premises do not endanger public health and the environment.

REDUCTION OF SEA-BASED SOURCES OF LITTER

While land-based waste is the biggest source of marine litter, an estimated 20% of marine litter can be linked to various sea-based sources.¹⁰ As a major transhipment hub, Singapore is committed to the managing sea-based sources of waste through the prevention of pollution from ships. For shipping, Singapore was among the first countries in Asia to ratify all six Annexes of the 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. The following actions are carried out by Singapore with the aim to reduce sea-based sources of marine litter.

4.2.1 Inspections on ships

As a responsible flag state and port state, Singapore conducts inspections on both Singapore-registered ships and foreign-registered ships in our port to ensure that they comply with regulations on garbage disposal into the sea and that anti-pollution measures are in place. Ships are also required to maintain garbage record and management plans for verification by inspectors. The Maritime and Port Authority of Singapore (MPA) patrols port waters to ensure that ships in the Port of Singapore do not discharge waste, oil, garbage, or sewage into the sea.

¹⁰ California Coastal Commission, 2016.

4.2.2 Offshore fish farms

Offshore fish farms are prohibited from dumping waste into the sea and routine farm inspections are carried out to ensure compliance. Enforcement action is taken against farms contravening the Fisheries (Fish Culture Farms) Rules under the Fisheries Act. Those found guilty of an offence are liable on conviction to a fine not exceeding \$10,000, or imprisonment for a term not exceeding 12 months, or both. Offshore fish farms are required to dispose their waste at bins located at Lim Chu Kang and Lorong Halus jetties, which are emptied daily by refuse trucks for incineration.

4.2.3 Cleaning of coastal waters

MPA deploys nine crafts on a daily basis to remove flotsam from the sea to ensure safe navigation of vessels. The cleaning efforts are stepped up during the monsoon seasons by deploying these crafts according to the prevailing monsoon.

Dive clean-ups are also organised by community groups contributing to the national effort to keep our coastal waters clean.

4.2.4 Implementation of MARPOL

In Singapore, MARPOL is implemented under the Prevention of Pollution of the Sea Act (PPSA) and its subsidiary legislation. MARPOL Annex V is implemented under the Prevention of Pollution of the Sea (Garbage) Regulations 2012 which provides for fines of up to \$20,000, or to imprisonment for a term not exceeding 2 years or to both, for offences committed. The Prevention of Pollution of the Sea (Garbage) Regulations 2012 apply to (i) Singapore-registered ships wherever they may be; and (ii) foreign-registered ships in Singapore waters. As part of our MARPOL obligations, the MPA deploys five garbage collection crafts daily at scheduled timings to collect garbage from ships at the anchorages. Bins are also provided at piers for harbour operators to dispose their waste as littering and waste disposal at sea is prohibited.



KEEPING THE PORT OF SINGAPORE LITTER-FREE

Garbage collection in the anchorages

MPA deploys five garbage collection crafts daily, including weekends and public holidays to collect garbage from ships at the anchorages. This service is complimentary. Ships with larger quantities of garbage can make arrangements for special disposal at a fee. The vessels are required to segregate their garbage into plastics and non-plastics before disposal. For more information on garbage collection from vessels anchored in Singapore, please visit: <https://www.mpa.gov.sg/web/portal/home/port-of-singapore/services/garbage-collection-services>

Flotsam clearance

Flotsam is defined as any floating object of reasonable size, including but not limited to tree trunks, plastic bottles, leaves, carcasses, drums, floating pontoons and dead fishes. Most of the flotsam in Singapore's waters is carried over by currents, tides and winds. In this regard, more flotsam is typically observed during monsoon seasons. MPA deploys nine flotsam clearance crafts to clear flotsam daily to ensure safety of navigation.



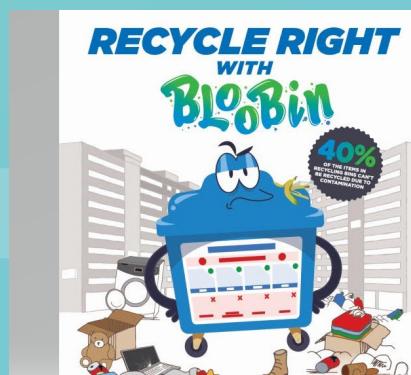
CIRCULAR ECONOMY APPROACH

While we minimise marine litter from entering the ocean, we also look to address waste at its source. Singapore does so by adopting a circular economy approach to waste and resource management which targets our key waste streams. Through this approach, we hope to prevent the general production of waste products, which if improperly disposed of, may find their way into the sea. To this end, we launched the Zero Waste Masterplan in 2019, which outlines Singapore's key strategies to reuse and recycle resources, turn trash into treasure, and produce and consume sustainably. Under the Masterplan, Singapore carries out the following measures that seek to close the waste loop through a circular economy approach.

4.3.1 Reducing the use of disposables

NEA launched the “Say YES to Waste Less” campaign in 2019 to encourage the public to reduce food wastage and use of disposables. As part of the campaign, waste reduction measures are emphasised, such as bringing reusable food containers, bottles and bags for takeaway and opting to go without disposable cutlery. NEA has also been encouraging the use of reusable cutlery and crockery in our hawker centres. For newer hawker centres, NEA has disallowed the use of disposables for dine-in meals from the start of the hawker centre’s operations. Since September 2018, disposables are also no longer permitted for dine-in when new cooked food stallholders start to operate at existing NEA-managed centres.

RECYCLING CAMPAIGNS IN SINGAPORE





4.3.2 Promoting recycling

Overall, 3 in 5 Singaporean households recycle regularly.¹¹ To increase household recycling rates, Singapore has implemented the National Recycling Programme since 2001. Public waste collectors are required to provide recycling bins and recyclable collection services to all Housing Development Board (HDB) apartment blocks, opt-in condominiums, and landed property premises for Singaporeans to recycle items including plastic easily, thus reducing the amount sent to Singapore's WTE plants for incineration and, consequentially, ash disposal at the Semakau Landfill. Since 2019, NEA has been actively engaging the public through the #RecycleRight campaign, which aims to encourage Singaporeans to recycle more and recycle right. These messages were reinforced at community events, on social media, through notices on HDB apartment lift doors and posters on noticeboards. NEA refreshes the labels on all recycling bins and chutes from time to time to improve the presentation of information on recycling, to help more households identify the right items to recycle.

Information on the recycling processes for recyclables collected from households is published on NEA's website.¹² To further highlight the importance of recycling and reducing waste sent

to landfill, the lifespan of Semakau Landfill is updated annually through MSE's Key Environmental Statistics publication.

To assist companies in assessing their current waste management practices, and identifying opportunities to reduce, reuse and recycle waste materials to reduce waste disposal needs, NEA has published 3R Guidebooks for premises such as hotels, shopping malls, offices and industrial developments.

4.3.3 Legislations

Singapore implemented the landmark Resource Sustainability Act (RSA) in 2019, which provides the legislative framework to impose upstream regulatory measures to address our priority waste streams – e-waste, food waste, packaging waste including plastics. The RSA marks a paradigm shift in our approach to waste management – while efficient waste disposal is necessary, our goal is first and foremost to reduce, reuse and recycle. Regulations under the RSA include the Extended Producer Responsibility (EPR) Framework for e-waste, a Mandatory Packaging Reporting framework, and mandatory segregation and treatment requirements for food waste. We will also introduce a beverage container return scheme in the coming years as the first phase of the EPR for packaging waste.

¹¹ Based on MSE and NEA's Household Recycling Surveys 2021.

¹² <https://www.nea.gov.sg/our-services/waste-management/3r-programmes-and-resources/types-of-recyclables-and-recycling-processes>.

RESEARCH AND DEVELOPMENT

A robust, science-based approach drives Singapore's National Action Strategy and its supporting policies. To this end, we work in close partnership with academia and industry, to deepen our understanding of the marine litter challenge, and co-create solutions and promote circularity to address and reduce marine litter.

In the first research of its kind in the region done by Ng and Obbard, particles of polyethylene, polypropylene, polystyrene, nylon, polyvinyl alcohol and acrylonitrile butadiene styrene were found in seawater and sediment particles in Singapore's coastal region. The research considered that these microplastics were most likely derived from larger debris that was broken down, based on samples from public beaches where end-user plastic litter was common. Today, Singapore continues to conduct research on projects (through the Urban Solutions and Sustainability (USS) domain of the national Research, Innovation, and Enterprise (RIE) 2025 Strategy), and support activities and measures such as monitoring programmes and preventive technology.

Through these research efforts, we hope to promote knowledge sharing, such as between experts, and to deliver long-term solutions that will strengthen institutional and human capacities to address the issue of marine litter.



4.4.1 Membrane bioreactor (MBR) technology systems at water reclamation plants

MBR technology will continue to play an important role in the removal of microplastics in used water in Singapore, and reduce the amount of microplastics discharged into the sea. Under the USS domain in RIE 2025, Singapore is investing in research and development into MBR technology and other water treatment technologies, with the aim to improve the efficiency and reduce the cost of water reclamation efforts in Singapore.

4.4.2 NUS-NParks Marine Debris Study

NParks has collaborated with the National University of Singapore (NUS) on a research project on marine debris in Singapore which started in 2016 and concluded in 2020. The study sought to establish baseline data on marine debris on Singapore's shores, develop a citizen science programme to monitor macro-debris and micro-debris (specifically microplastics), and facilitate dialogue with stakeholders to formulate policy recommendations.

The study found that the most common macro-debris are styrofoam pieces, hard plastic fragments, film plastic pieces, food wrappers and straws, whereas the common types of micro-debris are styrofoam, film, hard plastic fragments and pellets.

During the study, higher macro-debris trash volumes were observed at the northern recreational beaches of Changi Beach, Pasir Ris, Punggol, Coney Island and Sembawang during the Northeast Monsoon (December to early March), and southern coasts, such as East Coast Park, during the Southwest Monsoon (June to September), indicating that marine litter in Singapore was brought in by natural tidal conditions observed through the monsoons. It was observed that there was no seasonality influence for micro-debris.

¹³ Ng & Obbard, 2006.



Citizens involved in sampling activities for the NUS-NParks Marine Debris Study

To build on current knowledge of the marine litter situation in Singapore, and in coordination with the NUS-NParks Marine Debris Study, NEA has embarked on a Marine Litter and Microplastics Consultancy Study, to provide a better understanding of the levels and pathways of marine litter and microplastics in Singapore's inland waterways, coastal waters, and recreational beaches.

Data and methods used in both studies will be incorporated into a future national monitoring programme where appropriate.

4.4.3 Use of technology

Singapore continues to explore the use of technology in developing solutions to address marine litter effectively and efficiently. Six seabins were installed at the Marine Barrage Jetty to remove flotsam in the area which is not easily accessible by boat.

For beach cleaning, the Beach Bobcat and Robocut Beach Cleaning Machine are used to increase cleaning efficiency. For coastal waters, MPA awarded the MINT (Maritime Innovation and Technology) Product Development fund in 2019 to ST Engineering for the development of an autonomous flotsam clearance vessel, to improve the coastal flotsam clearance process. The project concluded in 2021 with a proof-of-concept involving the fabrication, testing and demonstration of a prototype vessel to conduct automatic flotsam clearance at Woodlands Jetty. MPA is currently exploring the deployment of these autonomous flotsam clearance vessels for further field testing in real world conditions by 2023.

INCREASING EFFICIENCY AND EFFECTIVENESS IN CLEANING UP AND PREVENTING MARINE LITTER IN SINGAPORE

Singapore has adopted various technologies to improve the efficiency and effectiveness of our efforts to clean up litter in our waterways and port waters to address marine litter. Examples are as follows.

Beach Cleaning Machines



Bobcat beach cleaning machine



Robocut remote control beach cleaning machine

Litter Traps installed at Waterways



Seabins at Marina Barrage Jetty



PROMOTING AND STRENGTHENING OUTREACH AND STAKEHOLDER ENGAGEMENT

As an island-state with a well-endowed coastal and marine environment, Singapore is cognisant of the impact of marine litter on the environment and society. As the issue of marine litter is also connected to individual behavioural patterns related to production, consumption, waste disposal, and littering, Singapore seeks to pursue continued engagement with various stakeholders, such as civil society organisations (CSOs), industry experts, and academic and technical experts, in developing solutions to tackle marine litter. By galvanising community efforts, and promoting coordination and cooperation, we aim to invigorate and support the People-Private-Public (3P) sector in co-creating integrated waste management and wastewater treatment solutions that help to reduce marine litter. (See Annex A for examples).

4.5.1 People, Private and Public (3P) Partnerships

3P sectors have initiatives to reduce the generation of land-based solid waste, including plastic waste. For example, retailers such as Starbucks and IKEA encourage consumers to bring their own reusables by either charging for single-use plastic bags, incentivising the use of reusables or by not making them available.

4.5.2 Raising awareness through collaboration with ground-up initiatives

Environmental groups such as Zero Waste SG, Public Hygiene Council (PHC) and Waterways Watch Society (WWS) foster shared ownership in keeping the environment clean and minimising waste. These groups play an important role in raising awareness and getting the public to take action to keep our land and watercourses clean. Non-profit groups have also organised maritime environmental outreach programmes to raise public awareness on the importance of protecting the marine environment and biodiversity among members of the public, such as talks on marine conservation, underwater clean-up, and litter-picking activities on our water surface and on our shores.

COMMUNITY CLEAN-UP INITIATIVES



Citizens collecting litter and helping with data collection in community clean up initiatives

4.5.3 Engaging citizens to co-create solutions

Under the Zero Waste Masterplan, several Citizens Workgroups have been organised to engage citizens to co-create solutions. A Workgroup on Recycling Right was convened in 2019 to co-create solutions to improve household recycling. The redesign of the recycling bins was one of the recommendations proposed by the members which involved a transparent bin with clear messaging. MSE and NEA undertook a pilot project on the use of the transparent recycling bins in November 2021. Another recommendation from the workgroup was the National Deposit and Return Scheme for beverage containers (i.e. beverage containers return scheme), which will be implemented in the coming years and be part of the efforts to increase Singapore's recycling rate to 70% as part of the Zero Waste Masterplan.

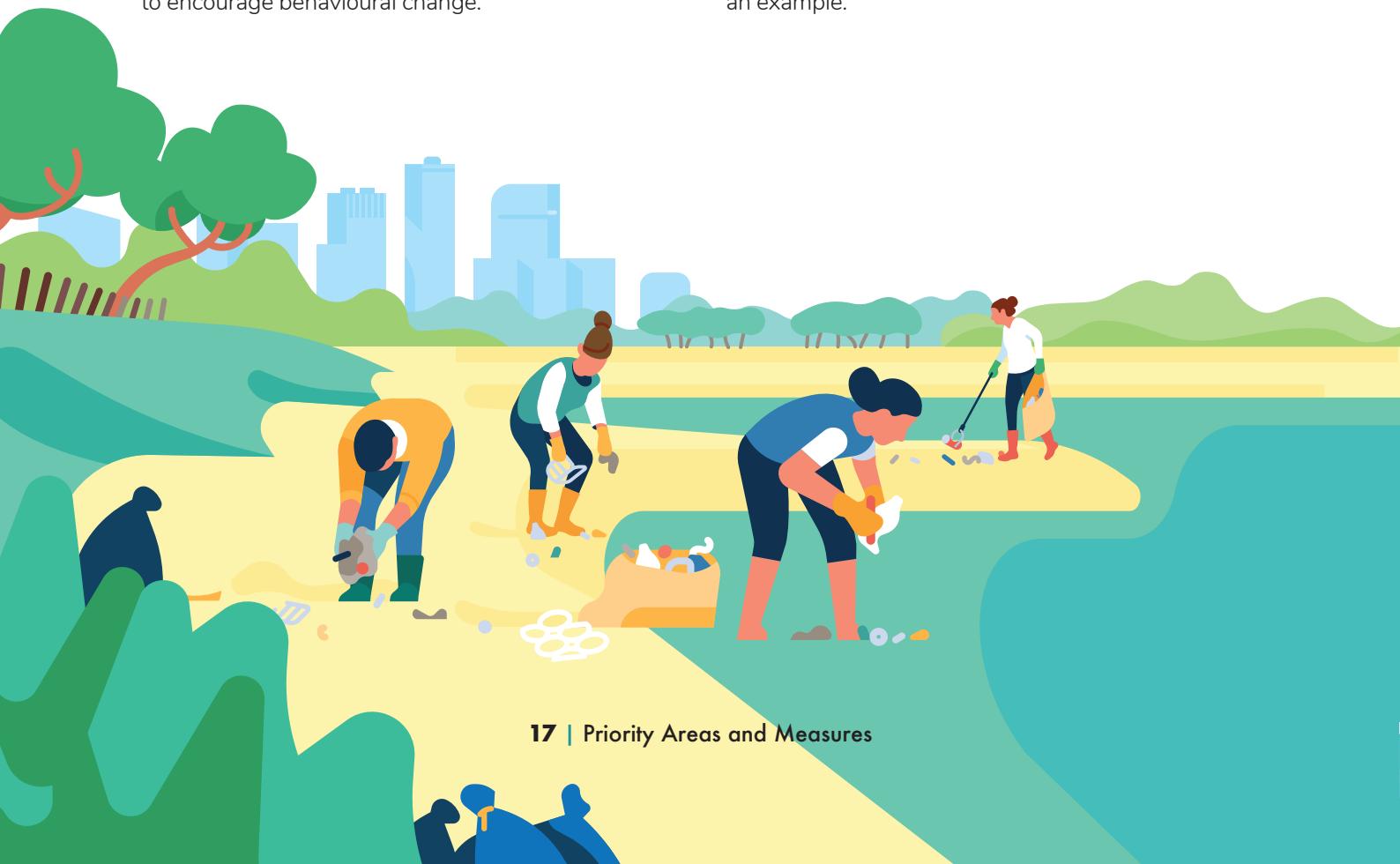
A Citizens' Workgroup on Reducing the Excessive Consumption of Disposables was also convened in 2020 to co-create recommendations to address the excessive use of disposables, including single-use plastics. Eight recommendations from the workgroup were supported, including recommendations to impose a charge for carrier bags at supermarkets to reduce the use of such bags, and the use of nudges to encourage behavioural change.

4.5.4 Community initiatives

Community initiatives have played a significant role in raising awareness and supporting action to address marine litter and promote sustainability in Singapore. These ground-up groups have spurred public participation and discussions to ignite a change in the mindsets and behaviours of Singaporeans. Various initiatives with different target groups are frequently organised across the island to advocate for environmentally sustainable practices (Annex A). In 2021, these community groups were also consulted to provide feedback on the development of this National Action Strategy and share recommendations to improve the marine litter situation in Singapore.

4.5.5 Educating youths

Lessons with elements of sustainability have been incorporated into the national school curriculum for youths. These aim to instil a sustainability mindset, help youths understand the impact of their actions on the environment, and inculcate the values of care, respect, and responsibility for the environment. Using real-world examples and case studies, youths learn about pollution-related issues in the sciences and humanities, with marine litter often cited as an example.



INTERNATIONAL ENGAGEMENT AND COLLABORATION

Given the transboundary nature of marine litter, Singapore contributes actively to regional and international efforts to coordinate action and work towards a collective approach to raise awareness and tackle the global problem of marine litter pollution.

4.6.1 International and regional platforms

Internationally, Singapore has been an active participant in initiatives on marine litter. For example, Singapore participated in the United Nations Environment Programme's (UNEP) work on marine litter and microplastics, including the Ad-Hoc Open-Ended Expert Group (AHEG) on Marine Litter and Microplastics, which seeks to follow-up on the United Nations Environment Assembly (UNEA) Resolutions 4/6 and 4/9 on Marine Plastic Litter and on Addressing Single-Use Plastic Products Pollution.

Singapore also participates actively in discussions under the UNEA to develop a new international legally binding instrument on plastic pollution, which will also address plastic pollution in the marine environment. Singapore also participated in the G20's work under the Japanese G20 Presidency to establish the 2019 G20 Implementation Framework for Actions on Marine Plastic Litter. These platforms have allowed Singapore to contribute to global efforts to address marine litter and play a part in developing international best practices and guidelines to address marine litter.

Regionally, Singapore, alongside other ASEAN member states, adopted the Bangkok Declaration on Combating Marine Debris and the ASEAN Framework of Action on Marine Debris, to protect the marine environment and strengthen regional cooperation

on marine debris issues at the 34th ASEAN Summit in June 2019. As a follow-up to the Framework of Action, Singapore worked with ASEAN Member States to develop an ASEAN Regional Action Plan on Combating Marine Debris (RAP). The RAP was endorsed and adopted by the ASEAN Ministerial Meeting on the Environment (AMME) in May 2021. Singapore is also active in marine litter initiatives organized by the Coordinating Body on the Seas of East Asia (COBSEA). Singapore's participation at these regional platforms has also allowed us coordinate efforts with our neighbours and address marine litter collectively as a region.

4.6.2 Other cooperation

Singapore conducts capacity building programmes under the Singapore Cooperation Programme (SCP) to support other developing countries in combatting marine litter.

Singapore partnered Norway under the Singapore-Norway Third Country Training Programme (TCTP) to conduct a Regional Training Programme on Waste Management and Reduction of Marine Litter for government officials from the Asia-Pacific region. We also partnered Japan under the Japan-Singapore Partnership Programme for the 21st Century (JSPP21) to conduct two courses on "Management of Waste and Reduction of Marine Litter" for government officials from Southeast Asia, South Asia and the Pacific. Another example is our partnership with the United States under the Singapore-United States Third Country Training Programme (TCTP), where we conducted the "Workshop on Addressing Plastic Pollution through Integrated Waste Management Strategies and Circular Economy" for government officials from ASEAN Member States and Timor Leste, and the ASEAN Secretariat.

05

Looking Ahead

Singapore currently has a suite of comprehensive, science-based measures to address the issue of marine litter. Further studies are being carried out to build upon our existing knowledge base to help us deepen our understanding of the scope and scale of marine litter, specific to Singapore's context. This will enable us to further sharpen our efforts and put in place more targeted measures, particularly with regard to the movement or pathways of marine litter and their effects on the ecosystem.

Addressing marine litter requires national action. The Government works in partnership with our communities and stakeholders to put in place enduring solutions to tackle this challenge. This National Action Strategy on Marine Litter seeks to galvanise and invigorate further efforts from all sectors of society, which will be critical in bringing about lasting change. Through this whole of nation approach, we hope to ensure Singaporeans can continue to enjoy the coastal and marine environment that surrounds our island home for generations to come.

Annex A: List of Community Initiatives

Initiative	Actions
Reducing Land-Based Sources of Marine Litter and Promoting and Strengthening Outreach and Stakeholder Engagement	
Citizens' Workgroup On Reducing Excessive Consumption of Disposables (RD CWG)	The RD CWG was convened in 2020 to co-create recommendations to reduce the excessive use of disposables, including single-use plastics. The RD CWG brought together a diverse group of workgroup members from different backgrounds, professions, and demography to develop a better understanding of the perspectives and concerns of different segments of the population regarding the use of disposables. Through the process of learning and co-solutioning with relevant stakeholders, the workgroup members developed and finetuned their ideas, and submitted 14 recommendations to MSE and NEA in relation to reducing the excessive consumption of disposables such as carrier bags, food containers, cutlery, and packaging. MSE and NEA supported eight recommendations and would also be working with the People, Private and Public (3P) sectors to co-deliver six other recommendations.
International Coastal Cleanup Singapore	The International Coastal Cleanup Singapore conducts an annual environmental exercise with data collection of marine debris since 1992. More than 3,000 volunteers come together to clean up Singapore's shorelines. In 2018, 20,915 cigarette butts were collected during the International Coastal Cleanup in Singapore, with the highest number of cigarette butts found at beaches in East Coast and Changi. The programme also aims to improve education and outreach efforts about the marine environment.
Little Green Men Singapore	This initiative organises coastal clean-ups in mangrove environments with volunteers.
Our Singapore Reefs	This initiative organises dive clean-ups with volunteers.
Small Change	This initiative organises coastal and dive clean-ups with volunteers and corporate groups. They also conduct outreach, conservation, and waste management talks.
Trash Hero Singapore	This initiative organises coastal clean-ups with volunteers.
Coastal Clean-ups @ Kranji Mudflats by Nature Society (Singapore)	This initiative organises coastal clean-ups with volunteers.
#SeasTheDay Beach Clean-up by Youth Corps Singapore	This initiative organises coastal clean-ups organised by youth volunteers.
Seven Clean Seas	This initiative organises coastal clean-ups and outreach for individuals and corporates.

Initiative	Actions
Promoting and Strengthening Outreach and Stakeholder Engagement	
East Coast Beach Plan	<p>This is a ground-up initiative set up in July 2020 to organise beach clean ups by volunteers at designated areas in Singapore. The volunteers organise themselves through a Telegram group, which has more than 2,800 members. In August 2020, the group collected about 9,600kg of litter.</p>
Kayak N Klean Programme by People's Association Passion Wave	<p>The Kayak N Klean programme is one of PAssion WaVe's signature activities that combines water sports with environmental conservation. Participants work together to pick up litter, whilst kayaking along Singapore's many scenic waterways and coastal areas, contributing towards a common goal of conserving the environment and making it a better place for all. In addition to promoting a sense of ownership toward our environment, the programme also aims to increase awareness and understanding of the importance of marine life and nature conservation.</p>
'CleanPods' by Public Hygiene Council (PHC)	<p>This is an initiative to install storage sheds (or 'CleanPods') containing cleaning equipment such as tongs, buckets, and carts for transportation of tools and trash at popular beach and park clean-up locations. The tools are made available to volunteers doing clean-ups. The intent is to reduce waste and promote re-use of litter picking tools.</p>
Plastic-Lite Singapore	<p>This initiative focuses on education and outreach efforts to reduce the consumption of plastics. Plastic-Lite Singapore is co-delivering a voluntary guideline for F&B establishments on reducing excessive use of disposables with NEA, which is one of the recommendations that arose from the Citizens' Workgroup on Reducing Excessive Consumption of Disposables. The voluntary guideline will consist of a checklist of sustainable practices that F&B establishments can adopt to reduce their use of disposables. It will be circulated to NEA's network of F&B partners and made available on NEA's website for download. Part of the checklist may also be incorporated into the evaluation criteria of the Singapore Environment Council's Eco F&B Certification for F&B establishments.</p>
Research and Development	
Marine plastics research by National University of Singapore (NUS), St John's Island Marine Laboratory and Singapore Centre for Environmental Life Sciences Engineering (SCELSE) and other research groups	<p>Examples of past and ongoing research:</p> <ul style="list-style-type: none"> - Baseline of macro-debris and microplastics on Singapore's shores - Impacts of fishing gear on marine life - Marine plastic as a transport vector or pathway - Transfer of nanoplastics between life stages of target marine species - Potential toxicity of plastic particles on target marine species
Understanding the Impact of Plastic Pollution on Marine Ecosystems in South-East Asia (South-East Asia Plastics (SEAP) programme)	<p>Singapore's National Research Foundation (NRF) and the United Kingdom's Natural Environment Research Council (NERC) funded research on the impacts and risks of plastics in marine ecosystems (including mangroves, coral reefs and beaches) and the essential services these ecosystems provide, in order to support the development of mitigation measures.</p>

Annex B: References

California Coastal Commission. 2016. "The problem with marine debris," January. <http://www.coastal.ca.gov/publiced/marinedebris.html>.

Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) (IMO/FAO/UNESCO-IOC/UNIDO/WMO/IAEA/UN/UNEP/UNDP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection). 2015. "Sources, fate and effects of microplastics in the marine environment: A global assessment." #90. Rep. Stud. GESAMP. .org/data/gesamp/files/media/Publications/Reports_and_studies_90/gallery_2230/object_2500_large.pdf.

Jambeck, Jenna R., Roland Geyer, Chris Wilcox, Theodore R. Siegler, Miriam Perryman, Anthony Andrady, Ramani Narayan, and Kara Lavender Law. 2015. "Plastic waste inputs from land into the ocean." *Science* 347 (6223): 768-771. <http://www.sciencemag.org/content/347/6223/768>.

Ng, K. & Obbard, J., 2006. Prevalence of microplastics in Singapore's coastal marine environment. *Marine Pollution Bulletin*, 52(7), pp. 761-767.

Spalding, M., Fox, H., Allen, G. & Davidson, N., 2007. *Marine Ecoregions of the World: A Bioregionalization of Coastal and Shelf Areas*. BioScience, 57(7), pp. 573-583

Scientific and Technical Advisory Panel (STAP) 2011. *Marine Debris as a Global Environmental Problem: Introducing a solutions based framework focused on plastic*. A STAP Document. Global Environment Facility, Washington, DC.

UNEP (United Nations Environment Programme) and IOC (Intergovernmental Oceanographic Commission). 2009. "UNEP/IOC guidelines on survey and monitoring of marine litter." http://www.unep.org/regionalseas/marinelitter/publications/docs/Marine_Litter_Survey_and_Monitoring_Guidelines.pdf.

UNEP (United Nations Environment Programme) 2017. "Plastic and Microplastic in our Oceans – A Serious Environmental Threat".

UNGA (United Nations General Assembly). 2004. *Oceans and the law of the sea: Report of the Secretary-General—Addendum*. August 18. A/59/62/Add.1. <http://www.un.org/ga/59/documentation/list0.tml>.

