

6 Maldives

6.1 Marine plastic pollution in Maldives

Maldives has many of the elements required for a comprehensive national strategy to address marine plastic pollution (MPP).¹⁸⁵ This report is a first step to estimate the scale of MPP, to describe the sources of MPP and to provide a basis for a national dialogue and action plan on MPP. It places particular emphasis on the use of the existing solid waste management system and awareness-building initiatives; on environmental sustainability policies, on development of the circular economy, on regional cooperation and on identifying practical steps to combat MPP. The report is a working paper intended as a basis for stakeholder consideration and to be used to develop more in-depth analyses, to help align existing activities in Maldives, to identify possible gaps and areas requiring additional efforts.

6.1.1 Sources of marine plastic pollution

There are three main sources of MPP in Maldives:

- mismanaged, or unmanaged solid waste and litter, which is the most important
- marine sources, mainly fishing activities, tourism and shipping and
- plastics that may be transported by ocean currents from other countries.

The different sources are discussed in more detail below. Plastic waste is part of a much broader waste management problem, one of a range of sustainable development challenges faced by Maldives. The following sections provide a preliminary estimate of marine plastic pollution (MPP) in Maldives and provides a synthesis of available information on MPP, including on microplastic marine pollution.

Maldives is unique in the WIO region with almost 1200 islands stretching over 870 km (north-south) but with only about 300 km² land area. The islands are grouped in 26 atolls (for administrative purposes 20 atolls clustered in 7 provinces). The economic geography has created major solid waste management problems.¹⁸⁶ Scarcity of 'natural' water supplies has led to particularly extensive use of and dependence on bottled water and plastic containers. Manufacture of local consumer products is largely insignificant so that many products are imported in various forms of plastic containers, or packaging. Land scarcity has led to the creation of a 'waste island' or dedicated landfill island and the cost of waste transport from islands to managed disposal sites is high. The important tourism component the economy generates significantly more per capita plastic waste than the resident's economy.¹⁸⁷ Landfill sites also face a significant threat from sea-level rise or potential disturbance as a result of any future tsunami.

6.1.2 Estimate of marine plastic pollution and its basis

MPP is estimated primarily as a function of mismanaged land-based solid waste in Maldives with some additions to reflect the marine sources.¹⁸⁸ The estimate of MPP relies on several assumptions based on population, solid waste generation, the proportion of plastic in the waste and the amount of mismanaged plastic waste that is transported into the marine environment. The basis for these assumptions is set out below.

¹⁸⁵ MPP is generally considered to account for about 80 percent of marine litter or debris.

¹⁸⁶ Similar issues are faced by a number of Pacific island atoll countries.

¹⁸⁷ Tourism accounts for over 30% of GDP and over 60% of foreign currency earnings (excluding 2020). About 80 islands have tourist resorts and tourist arrivals exceed one million/year (about 27,500 beds with 80% occupancy).

¹⁸⁸ See Jambeck et al., 2014 for a description of the methodology.

The population is about 540,000 thousand, of which 40.2 percent are considered urban.¹⁸⁹ Population density is about 1,800 per km², which is several times that of other AIODIS. However, the average population density does not reflect the far higher density of the 'urban' islands, as Malé has a population density of over 65,000 per km². For the purposes of the MPP estimate, the entire population is 'coastal'. By this is meant, that mismanaged plastic waste in any part of Maldives could potentially be transported to the sea by rain, flooding, wind, by deliberate dumping or littering on the shore, or at sea, or by atmospheric transport of particles of waste plastic which is frequently burned.

In 2017, total solid waste was estimated at about 280,000 tons and this is the value used to calculate MPP from solid waste.¹⁹⁰ While the total waste transported to the waste disposal site at Thilafushi in 2017 was reported at over 430,000 tons, this may reflect disposal of some waste which had accumulated on the islands for several years, or occasional construction waste. In 2019, Waste Management Zone 3 and/or Greater Malé and its outer island alone was estimated to generated 305,000 tons and 282,000 tons of mixed solid waste respectively.¹⁹¹ A 2011 study estimated that 19,000 tons per year was generated in the four northern atolls.

Solid waste generation differs between urban (1.8 kg/person/day), rural/ island (0.8 kg/person/day) and resorts (3.5 kg/person/day).¹⁹² Based on these differentiated values, the total waste generated is estimated at approximately 260,000 tons/ year (Table 12). Recent information on increased tourist bed capacity suggests that the contribution of 'resorts' may be underestimated when all tourist accommodation is included.¹⁹³

Table 12. Estimated waste generation in Maldives

| | Urban | Islands | Resorts* | |
|-----------------------------|--------------|----------------|--------------------|-----------|
| Total population | 540,544 | | resort beds | 33,000 |
| Population (%) | 0.35 | 0.66 | occupancy % | 0.8 |
| Population | 186,488 | 354,056 | beds per day | 26,400 |
| | | | tourist days/year* | 9,636,000 |
| Waste/person/day (kg) | 1.8 | 0.8 | | 3.5 |
| Waste per year (tons) | 122,522 | 103,384 | | 33,726 |
| Total waste per year (tons) | 259,633 | | | |
| Waste/resident/day (kg) | 1.32 | | | |

Sources: see text. * the number of tourist days/yr is a conservative estimate and may be higher (see 6.2.4).

Studies indicate that on average, 5.3 percent of waste is plastic.¹⁹⁴ The proportion of waste that is 'managed' varies by island or waste management area, as waste management plans are progressively implemented in the seven waste management zones. In Malé, most of the waste is collected and transferred to the regional 'waste island'. However, there is still substantial littering and disposal

¹⁸⁹ World Bank, 2019. <https://data.worldbank.org/>.

¹⁹⁰ World Bank, What a Waste 2.0. Other estimates range up to more than 350,000 tons annually. See also: Saleem, A. 2018. Environmental and Social Management Plan for the Establishment of Island Waste Management Centre in Th. Thimarafushi. Ministry of Environment and Energy.

¹⁹¹ ADB, 2018. Greater Malé Environmental Improvement and Waste Management Project. Project Document. Different sources provide quite different estimates of waste generation. See also: Regional Waste Management Facility at Thilafushi – Greater Malé Waste to Energy Project.

¹⁹² World Bank, 2017. Maldives Clean Environment Project. Project Appraisal Document. A 2015 report prepared for the Ministry of Tourism cited higher rates: urban 2.8 kg; island 1 kg and resort 7.2 kg. Ministry of Tourism (2015): Assessment of Solid Waste Management Practices and its Vulnerability to Climate Risks in Maldives - Increasing Climate Change Resilience of Maldives through Adaptation in the Tourism Sector, Maldives.

¹⁹³ Assuming that planned resort expansion has occurred and including some 133 tourist vessels with about 2,500 beds, there may be as many as 41,000 beds available. <https://timesofaddu.com/2021/01/17/41780-tourist-beds-operational-in-maldives>. However, the level of occupancy of the guesthouses and vessels is unclear.

¹⁹⁴ World Bank PAD (2017).

into the ocean. It is assumed that 5 percent of the plastic waste is mismanaged in Malé and of the mismanaged waste, 10 percent is transported or leaked into the ocean (e.g., plastic bottles, food wrappers, cigarette butts). Less than 1 percent of the waste generated by the resorts is assumed to be mismanaged, but all such mismanaged waste is considered to be leaked into the ocean. In the islands, it is assumed that 20 percent of the waste is 'mismanaged' as a substantial part of the organic waste is composted, at least on some islands. It is assumed that 20 percent of the mismanaged plastic waste is leaked into the ocean. This may occur through direct dumping, littering, by being blown from open waste dumps, or by particles from burning plastic. While there is little quantitative evidence for the assumptions, the collection of significant quantities of plastic during beach clean-ups suggests significant levels of MPP.¹⁹⁵ In addition, analysis of beached marine debris in the Chagos Archipelago indicates that bottles originating from Maldives were the third most common (after Indonesia and China).

Based on the above assumptions a preliminary conservative estimate of the annual MPP generated by mismanagement of solid waste is 256 tons/year (for a total waste estimate of 260,000 tons) and 275 tons/year when adjusted for 2017 total waste estimate of 280,000 tons/year (Table 13). The assumptions can be modified when more robust values are determined.

Table 13. Estimation of marine plastic pollution from solid waste mismanagement

| | Urban | Islands | Resorts | Total | Source |
|---------------------------------|---------|---------|---------|---------|----------------|
| Total waste | 122,522 | 103,384 | 33,726 | 259,633 | Table 12 |
| Plastic waste (% and tons) | 6,494 | 5,479 | 1,787 | 13,761 | WorldBank,5.3% |
| Mismanaged waste (%) | 5% | 20% | 0.25% | | assumed |
| Mismanaged plastic waste (tons) | 325 | 1,096 | 4 | 1,973 | calculation |
| Transport to ocean (%) | 10% | 20% | 100% | | assumed |
| Transport to ocean (tons) | 32 | 219 | 4 | 256 | calculation |

Source: see text.

The preliminary estimate of microplastic marine pollution is based exclusively on tyre abrasion and is estimated at 5-17 tons/year. This estimate, its basis and underlying assumptions described in section 0 and presented in Table 11. Given the recorded high levels of microplastic marine pollution in Maldives, attention could be directed to other sources (e.g. textiles, microbeads, marine paint) for any future estimates. The import of fishing gear is used as a proxy for generation of MPP from fisheries. In 2018, imports were approximately 180 tons (\$2.5 million) and 10 percent of this quantity is considered to be lost or abandoned nets and gear and effectively MPP.¹⁹⁶ Comprehensive information on MPP from shipping and from non-Maldives sources is not available and the values in are 'placeholders' which can be replaced as specific information becomes available. The estimate for non-Maldives sources is loosely based on quantitative information on beached plastic litter in the Chagos Archipelago. Additional background information on the generation of MPP from solid waste mismanagement, from fisheries, from shipping and from non-Maldives sources (e.g., via ocean currents) is presented in other sections below.

A preliminary estimate of total MPP in Maldives is 314 tons per year (Table 14). The sources and assumptions are provided in the table or in the above text. As additional or more accurate information becomes available, this preliminary estimate can be adjusted accordingly.

¹⁹⁵ An analysis of 'Save the Beach' clean-ups in 2016 indicated that 5.7% of the beach debris (by weight) was plastic (excluding composites).

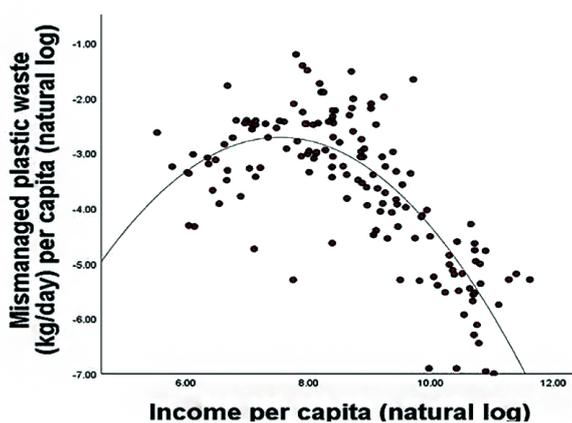
¹⁹⁶ Comtrade HS codes 5608 and 9507. The main tuna/ pelagics fishery is primarily a line (rather than net) fishery, but nets are used for baitfishing and reef/lagoon fishing.

Table 14. Estimated marine plastic pollution in Maldives

| Item | Total | Source/ Assumption |
|---|-------|--|
| MPP from mismanaged solid waste (tons/year) | 276 | see Table 12 |
| Shipping (tons/year) | 5 | local and int. shipping 5 tons (assumed) |
| Fisheries (tons/year) | 18 | 10% of imports of fishing gear (assumed) 180 tons |
| Microplastics at least (tons) | 5 | see Table 11 (car tyres only) range 5-17 tons |
| Non-Maldives sources | 10 | assumption (from ocean sources) |
| Estimated MPP (tons/year) | 314 | calculation |

There is a relationship between plastic waste and income levels (Figure 28).¹⁹⁷ The current decrease in Maldives’ GDP/capita may temporarily reduce plastic consumption, although this may be slightly offset by the increase in the use of plastics to combat the pandemic.

Figure 28. Relationship between income and mismanaged plastic waste



Source: Jambeck et al. (2015) & World Bank – WDI

Sources: Barnes, 2019; Jambeck, et al. 2015.

6.1.3 Management of solid waste

Solid waste management (SWM) is at various stages of development in different islands and atolls and in the seven different waste management zones (Figure 29).¹⁹⁸ The problems are well understood and solutions have been set out in the 2008 and 2015 waste management plans (see 4.2.1).

Several investment projects have contributed or continue to contribute to effective SWM. Of particular note are those supported by Japan, the World Bank and the ADB (see 4.2.1). Basically, the national waste management plan is being implemented island-by-island, atoll-by-atoll and SWM zone-by-zone.

¹⁹⁷ Barnes, Stuart J. 2019. Understanding plastics pollution: The role of economic development and technological research. *Environmental Pollution* 249, December 2019. <https://www.sciencedirect.com/science/article/abs/pii/S0269749119306505>

¹⁹⁸ Peterson, C. 2013. Assessment of Solid Waste Management Practices and Its Vulnerability to Climate Risks in Maldives Tourism Sector. Ministry of Tourism, Arts and Culture.

The plans have a similar basic model. Major investments are largely dependent on the external funding while the financial sustainability of the schemes is still embryonic and linked to the logistic demands of the zones. The main components of the model include:

- island waste management plans with a focus on household, business and community engagement to segregate of waste streams. Organic waste is composted, recyclable waste, including plastics, is to be sorted for sale and residual waste collected and transported to island waste management centres (IWMCs) and from there to Regional Waste Management Facilities (RWMFs).¹⁹⁹
- various community charges will be levied to cover a significant proportion of costs
- the Waste Management Corporation (WAMCO) is tasked to operate the collection services and management of the RWMFs and any managed landfills, such as on Thilafushi.
- the Thilafushi landfill, which serves the greater Malé region, is to be effectively managed (e.g. cessation of open burning, prevention of leaching)
- a suite of educational and awareness initiatives will enhance engagement at all levels
- supporting legislation will be enacted, including on SUPs and on EPR
- the plan(s) will be monitored, not only in terms of physical performance, but also in terms of cost-effectiveness and distribution of costs.

The Ministry of Environment and Energy has primary responsibility for SWM. It has a dedicated Waste Management and Pollution Control Department, for which the Waste Management Regulation (No 2013/R-58) is a key legislative instrument. The Environmental Protection Agency has a major operational role in handling EIAs and environmental monitoring. The Waste Management Corporation (WAMCO) is responsible for the SWM in the Greater Malé area, for the management of the Thilafushi landfill and regional/zone waste management centres (RWMC). Local government institutions at island (Island Councils), atoll (Atoll Councils) or regional levels are the 'front line' of SWM and its coordination and financing. The Ministry of Housing owns Thilafushi Corporation which controls Thilafushi island, the only officially designated area where large scale handling, processing, and disposal of solid waste is undertaken. Numerous businesses, community organisations and NGOs are actively involved in solid waste management and associated activities (e.g., promotion of sustainable consumption, recycling, raising awareness and beach clean-up).

Figure 29. Waste management zones



¹⁹⁹ Over 130 IWMC have been established since 2004.

Figure 30. Mismanaged plastic waste in island and urban areas

Hoandehoo (2018)



Malé region



Thilafushi

While considerable progress has been made, the standard of waste management at island level is reported to be highly variable. Local practices differ widely. For example, Maafushi Island (Kaafu atoll) council working with guesthouses (a major revenue source) organise cleaning of the harbour and seashore several times a week and the council employs workers to clean public areas daily. Some IWMCs are reported to be at full capacity and waste, including plastics can simply be dumped in the sea or on the shore, where it may be washed into the sea by high tides or storms. Little or no sorting of waste occurs on some islands. With dynamic leadership and higher awareness, other islands are making steady progress. As a result, without detailed review of Island Council reports and related information, the overall picture of waste management and the scale of mismanaged waste remains unclear.

In 2019, Maldives imported about \$85,000 worth of plastic goods, excluding resins, products in plastic packaging and fishing gear. There are at least three major producers of PET bottles for water or soft drinks.²⁰⁰

Solid waste from the Greater Malé area and from resorts across the Maldives, is transported to the Thilafushui landfill (Figure 9). The plastic and metal is recycled. While e-waste and hazardous waste is segregated the landfill remains an environmental threat. Construction waste is landfilled in the 'lagoon' to increase the land area of Thilafushi, which is later leased for industrial use (e.g. fuel storage). There are plans for waste to energy plants to be installed at Thilafushi. The RWMCs are subject to technical and economic feasibility analyses and to EIAs.²⁰¹

Figure 31. Formal waste management

Malé collection



Burning at Thilafushui landfill



Parley, PET recycling

²⁰⁰ Malé' Water and Sewerage Company (MWSC) is a PPP engaged in desalination and wastewater management, Coca Cola and Happy Market Pvt.Ltd.

²⁰¹ Although somewhat out of date, the following video clips illustrate the nature of some of the waste management issues: 'HILAFUSHI GON'DUDHOH, waste final destination in Maldives' (2013). <https://vimeo.com/69882321>. 'Gon'dudhoh' is Maldivian word for beach and also means dumping area. 'Dumpsters' (2013) <https://vimeo.com/54336860>.

6.1.4 Plastic pollution and the tourist industry

Although tourists generate an estimated 3.5 kg of solid waste per day and resorts account for about 13 percent of total solid waste, direct MPP from the tourist industry is considered to be low (4 tons/year), as the resorts have a relatively high standard of SWM and are required to comply with resort waste management regulations.²⁰² As part of their licencing conditions, a resorts is obliged to operate waste treatment equipment, such as a compacter (e.g. for plastic bottles, cans, packaging), incinerator, and bottle crusher. Many resorts do not use SUPs, unless guests specifically request a product.

Figure 32. Marine plastic clean-up activities in Maldives



However, it is unclear if the implementation of the solid waste management practices required in guest houses and marinas is effective.²⁰³ Microplastic pollution from tourism may be considerable if large quantities of synthetic textiles are laundered and waste-water is discharged without removal of microfibers (see 6.2.8).²⁰⁴ Much of the resort waste is shipped to Thilafushi, and while this eliminates a local problem, to a certain extent it merely allows the waste problem to accumulate at Thilafushi. A range of measures are planned to reduce all tourism-generated waste; reduce waste being sent to Thilafushi; and to secure the site against natural hazards (e.g. sea-level rise).

Many of the resorts are fully engaged in efforts by the business community and civil society to reduce MPP and build a more circular tourist economy. The resorts often take a leadership role as the reputation of Maldives tourism and resort incomes rely on clean seas. For example, Vakkaru Maldives has carried out beach clean-up at Baa Atoll Muthaafushi. In some cases, the underwater clean-ups are organised by dive centres. However, data from clean-ups does is rarely standardised or compiled to provide a quantitative picture of the sources, scale and rate of accumulation nationally, or in different atolls.²⁰⁵ Many resorts have guest 'codes of conduct' to ensure effective solid waste management. Several hotels participate in EarthCheck, a means to assess the resort's impact on the environment, local economy and cultural-heritage. The resorts have also contributed at a policy level through the Malé 3R Declaration.²⁰⁶

²⁰² <https://www.ststworld.com/thilafushi-maldives/>. See also: Petersen, op.cit.

²⁰³ Maldives has about 130 resorts (about 29,000 beds), over 480 guesthouses (about 8,000 beds), 12 hotels (1700 beds), over 200 dive centres and over 130 tourist vessels (about 2,400 beds).

²⁰⁴ Modern waste-water treatment should remove over 95 percent of microplastics. However, these remain in the sludge, which ultimately leak into the sea.

²⁰⁵ Various international guidelines for standardised survey, analyses and reporting are available.

²⁰⁶ 'Resorts in Maldives for the Promotion of 3Rs and Resource Efficiency Towards Protection of Local Environment and Marine Ecosystem'. Sixth Regional 3R Forum in Asia and the Pacific, 16–19 August 2015, Malé, Maldives. Maldives National 3R Day 16th August 2015.

Figure 33. Sources of MPP: tourism, fisheries, boat building and repair

6.1.5 Fisheries

As there is no direct information on MPP from fisheries in Maldives, the estimate given in should be considered as a 'place-holder' until such time as further information is available. Both local small-scale and large-scale fisheries and foreign fishing are potential sources of MPP through lost gear and at-sea garbage disposal.²⁰⁷ Losses are generally related to the type of gear and location where the fishing takes place. The import of fishing gear (nets, lines, buoys) is used as a proxy for an estimation of MPP from local fisheries. In 2018, total import of fishing gear (nets, lines, buoys) was 180 tons valued at \$2.5 million. FADs which use plastic ropes and netting are extensively deployed may also be lost and contribute to MPP. The quantities of lost gear from foreign fishing (longlines, gillnets, FADs) which may become lost and drift into the Maldives EEZ is unknown.

Maldives undertook a significant expansion of its fishing fleet over the last 10-15 years (over 1,200 vessels). Many of the new vessels used fiberglass (GRP) in part of the construction. GRP is technically difficult to recycle and disposal of GRP boats can be costly, such that owners may allow boats to sink or 'rot' on the beach or in harbours. Import of plastic resin in 2016 was over 9,600 tons but declined significantly in following years.²⁰⁸ While some of the imports may have been used for other purposes (e.g., manufacture of PET bottles), it suggests that unless appropriate disposal of end-of-life GRP vessels is practiced, GRP vessels may be a future source of MPP. In 2017, in association with Parley, the government launched a campaign to enlist fishers in recovery of marine plastic.²⁰⁹

6.1.6 Shipping

Galley waste from shipping can be a source of MPP, particularly if the waste disposal arrangements at ports are inadequate. Most major ports have waste reception facilities and implement the controls required under MARPOL Annex V. There are no reported irregularities regarding the access to waste disposal in AIODIS main ports. In addition, in some countries, growing offshore oil/gas exploration activities can be a source of MPP and effective waste management may require to be specified or included in any revisions of the legislation on marine pollution or in the terms and conditions of concessions. The Ministry of Transport & Civil Aviation, the Maldives Transport Authority and the Maldives Port Authority share responsibilities for control of ships waste.

²⁰⁷ FAO, 2016. Abandoned, lost and discarded gillnets and trammel nets: methods to estimate ghost fishing mortality, and the status of regional monitoring and management. FAO Technical Paper No. 600. Rome. Italy.

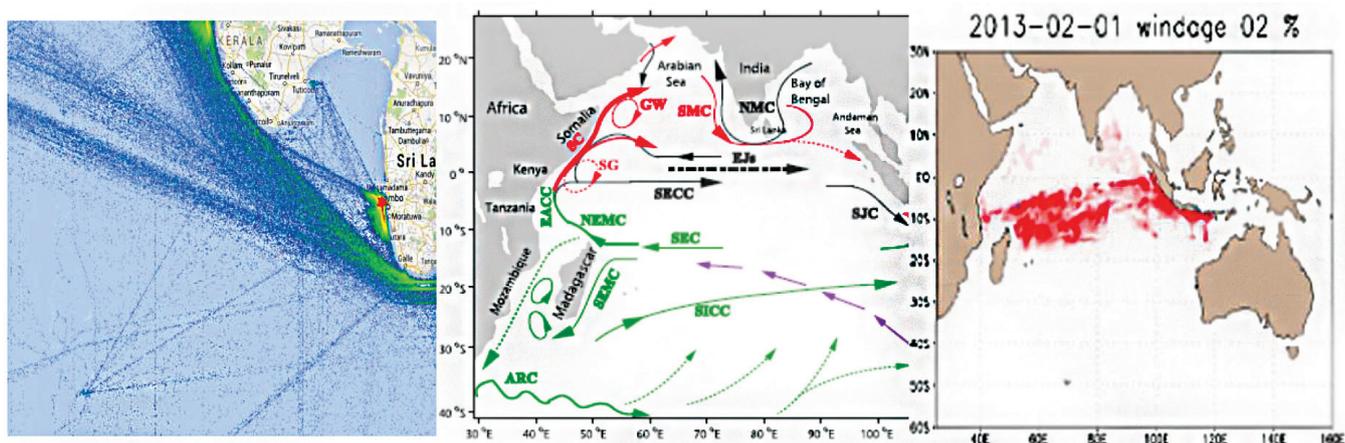
²⁰⁸ A detailed breakdown of plastic imports would be required to distinguish the various end uses. Recorded imports of PET resin alone have fluctuated 600-1,900 tons (2011-2016) suggesting some mis-declaration in customs records.

²⁰⁹ <https://maldivesindependent.com/environment/maldives-announces-campaign-to-intercept-ocean-plastic-131100>.

6.1.7 Ocean currents and MPP

Other than regional fisheries and shipping, the main external source of MPP is waste carried from Southeast Asia and from South Asia. With the exception of Maldives, South Asian coastal countries rank among the global 'top twenty' in terms of quantity of mismanaged plastic waste (Sri Lanka is ranked among the top six). Rivers are considered to be the primary source of MPP and the Ganges and the Indus are ranked among the top twenty global river sources of MPP. Models suggest that MPP from Southeast Asia may largely pass to the south of Maldives. It is certainly washed up on the Chagos archipelago, Alphonse Is. (Seychelles), St. Brandon and Agalega.²¹⁰ The Northeast Monsoon Currents are likely to carry MPP from the Bay of Bengal (see Figure 25). It is unclear if MPP from the western side of the Indian sub-continent is transported to Maldives, but a 'new' World Bank-funded project is likely to generate a greater understanding of MPP origins and transport the region. Maldives has an approved Marine Litter Action Plan, which recognises that seasonal changes in the patterns of surface ocean circulation may transport MPP, including FADs from major WIO tuna fishing areas via the Somali Current and other currents.²¹¹

Figure 34. Shipping traffic density, surface currents and plastic carried by ocean currents (model)



In 2018, about 60 tons of beach litter was collected on Diego Garcia, while volunteer clean-ups collect about 2 tons per year. In general, the beach debris is 80 percent plastic. There are ongoing efforts to assess the 'replenishment', i.e., the rate of accumulation of beached debris. As the local generation of plastic waste is negligible, the plastic in the beached marine debris has been transported by ocean currents.²¹³

²¹⁰ Peng, S. et al. 2015. Characteristics of the Near-Surface Currents in the Indian Ocean as Deduced from Satellite-Tracked Surface Drifters. Part I: Pseudo-Eulerian Statistics. *Journal of Physical Oceanography* 45(2):441-458.

²¹¹ EPA, 2018. Maldives Marine Litter Action Plan, Maldives. Environmental Protection Agency.

²¹² South Equatorial Current (SEC), South Equatorial Countercurrent (SECC), South Indian Ocean Countercurrent (SICC), Northeast and Southeast Madagascar Current (NEMC and SEMC), East African Coastal Current (EACC), Somalia Current (SC), Equatorial Jets (EJs), Southwest and Northeast Monsoon Currents (SMC and NMC), Northeast and Southeast Madagascar Currents (NEMC and SEMC), Great Whirl (GW), and South Gyre (SG). Summer (winter) red (black), all seasons green. Line thickness here represents the strength of current. For the ocean drift model see: Peng, S. et al. op. cit.

²¹³ <https://biot.gov.io/wp-content/uploads/2018-Annual-Report-BIOT-Final.pdf>; <https://www.darwininitiative.org.uk/documents/DPLUS090/24980/DPLUS090%20AR1%20-%20edited.pdf>.

Plastic comprised 87 percent (by number of items) of beached marine debris on remote beaches in the Lakshadweep Islands, of which 45 percent and 35 percent was attributed to fishing and tourism respectively.²¹⁴ Kochi (Kerala) is estimated to produce 5-14 tons of MPP per day.²¹⁵ In 2014, over 20 percent of the beach marine debris in Kerala was plastic, in Lakshadweep about 45 percent and in Maharashtra 80 percent. Kerala and Maharashtra beaches recorded levels of about 4 gm/m² while Goa and Karnataka had levels over 170 gm/m².²¹⁶ Particularly high levels of MPP and marine litter are reported from Sri Lanka, originating from mismanaged solid waste, tourism and from fisheries.²¹⁷

A 2010 survey on 15 of the St. Brandon islets (38 km of shoreline) recovered 50,000 items of which 79 percent were plastic. Flip-flops alone were 23 percent. The labelling indicated the products were mostly of Asian origin (i.e., brands generally not sold in the region).²¹⁸ As St. Brandon is some 3,350 km from the source of these items, they have either been transported by the South Equatorial Current and Equatorial Counter Current or dumped from fishing or cargo vessels. However, specific information on the quantities of MPP arriving in Maldives is not available and beach clean-up activities do not sort debris by possible origin. Studies of beach debris in South Africa suggest a useful approach to determining the origins.²¹⁹

6.1.8 Microplastics

The level of marine microplastic pollution depends on a wide range of factors. Population, density of housing and the type of treatment of waste water are important. In Maldives, the close proximity to the sea and high seasonal rainfall means that a significant proportion of microplastic pollution is likely to get flushed into the ocean. The main sources are likely to be road runoff of rainwater containing microplastics from car tyre abrasion; untreated waste water (microbeads in cosmetics, cleaning agents, laundry); and air-borne microplastics from paints or building materials; and breakdown of macroplastics by wind and sun and by wave action on beached plastics.

The populous Naifaru island (Lhaviyani Atoll) has been found to have particularly high concentrations of microplastics in sediments (55-1127.5 particles per kg), even higher than a highly populated site in Tamil Nadu (3-611 particles per kg). Similar concentrations were found on inhabited and uninhabited islands elsewhere in the Maldives (197-822 particles/ kg).²²⁰ Sampling at the remote, low population, Faafu Atoll found 22.8±10.5 particles/m² in the beach sediments. The plastics included polyethylene, polypropylene, polystyrene, polyvinylchloride, polyethyleneterephthalate, and polyamide and charred

²¹⁴ Kaviarasan, T. et al. 2020. Assessment of litter in the remote beaches of Lakshadweep Islands, Arabian Sea. *Marine Pollution Bulletin* Volume 161, Part B, December 2020, 111760.

²¹⁵ Das, S. et al. 2020. Assessing Marine Plastic Pollution in India. IEG Working Paper No. 389. Delhi. The estimates are based on the approach taken by Jambeck, 2015. See also: Annapu, R K (2012): Sustainable solid waste management in India, Waste-to-Energy Research and Technology Council (WTERT), Columbia University, Earth Engineering Center. http://www.seas.columbia.edu/earth/wtert/sofos/Sustainable%20Solid%20Waste%20Management%20in%20India_Final.pdf.

²¹⁶ Kaladharan, P. 2017. Prevalence of marine litter along the Indian beaches: A preliminary account on its status and composition. *J. Mar. Biol. Ass. India*, 59 (1), January-June 2017.

²¹⁷ Gunasekara, A.J.M. 2018. Status of Marine Litter Management in Sri Lanka. Report to the South Asian Cooperative Environment Programme. Marine Environment Protection Authority.

²¹⁸ Bouwman, H., et al. (2016). «The flip-or-flop boutique: Marine debris on the shores of St Brandon's rock, an isolated tropical atoll in the Indian Ocean.» *Marine environmental research* 114: 58-64. For additional studies see: Duhec, A. V., et al. (2015). Composition and potential origin of marine debris stranded in the Western Indian Ocean on remote Alphonse Island, Seychelles. *Marine pollution bulletin* 96(1): 76-86; Barnes, D., 2004. Natural and plastic flotsam stranding in the Indian Ocean. The effects of human transport on ecosystems: Cars and planes, boats and trains. Davenport, D. & Davenport, J. (Eds.). Royal Irish Academy, Dublin, 193-205.

²¹⁹ Ryan, P.G. 2019. Rapid increase in Asian bottles in the South Atlantic Ocean indicates major debris inputs from ships. 20892-20897 *PNAS* October 15, 2019 vol. 116 no. 42. www.pnas.org/cgi/doi/10.1073/pnas.1909816116.

²²⁰ Maldivian Times, August 5, 2020. <https://maldiviantimes.com/maldives-records-highest-level-of-micro-plastic-pollution-on-the-planet/>; Patti, T.B. et al. 2020. Spatial distribution of microplastics around an inhabited coral island in the Maldives, Indian Ocean. *Science of The Total Environment*. Volume 748, 15 December 2020, 141263.

microplastic particles, presumed to be associated with burning waste on, or near beaches.²²¹ A 2011 beach litter survey on Faafu (Nilandhoo) found that 57 percent of the waste was plastic.

There is speculation that the elevated levels of microplastics are attributable to leakage from waste sites, including Thilafushi; from the continued breakdown of microplastic already in coastal sinks; or transported by currents from outside Maldives. Other possible sources include the overflow of septic tanks, inadequate sewage and waste-water treatment, or disposal of sludge. There is likely to be a high runoff of microplastic on Malé as it is a dense built environment where microplastics from tyre dust, paint and building materials are likely to be washed directly into the ocean.

The marine microplastic pollution load was estimated on the basis of car tyre abrasion, which is considered to be a major main source of marine microplastic pollution, at least on Malé. It is estimated (i) on the basis of tyre imports and (ii) on a generic loss of tyre mass per vehicle (Table 11). The stock of motor vehicles in Maldives is approximately 92,000 each of which generates about 1.8 kg of microplastic waste per year, as tyres are compound of plastics and rubber.²²² Maldives imported an estimated 490 tons of tyres in 2019. As the roads are in close proximity to the sea in Maldives, microplastics from tyre abrasion are likely to be washed into the sea. The preliminary estimate of microplastic marine pollution ranges from 5-17 tons/year as set out in Table 11. The table is provided as a basis for more accurate future estimates.

Table 15. A. Range of estimates of microplastic marine pollution from car tyres in Maldives

| | A. tyres | B. vehicles | source/ assumptions |
|--|----------|-------------|-------------------------------------|
| A. Maldives car tyres 2019 (tons) | 490 | | calculation from import value |
| B. Vehicles in service (numbers) | | 92,983 | Maldives Transport Authority |
| A. Annual microplastic loss (tons) | 49 | | 10% Kole et al. |
| B. Weight loss all /vehicles/year (tons) | | 171 | 1.84 kg/vehicle/year based on India |
| Retention in soil | 44 | 154 | 90% retention by soil (Kole) |
| Transport to the ocean (generic) | 5 | 17 | 10% (generic) (Kole) |

Source Kole et al.²²³

There is already an awareness of marine microplastic pollution, e.g., a workshop was held in 2019 in South Ari Atoll focused on the uptake of microplastics by whale sharks. The Environment Minister and the Parliamentary Committee on Environment and Climate Change has noted the high levels.²²⁴

6.2 Existing and potential measures to combat MPP

Maldives does not have specific policy or plan to combat MPP. However, the suite of national waste policies and plans and specific regulations on plastic, and on SUPs in particular, implement, or set out a comprehensive set of strategic actions which effectively comprise most of the elements of a national plan to combat MPP.

²²¹ Saliu F, et al. 2018. Microplastic and charred microplastic in the Faafu Atoll, Maldives. Mar Pollut Bull. 2018 Nov;136:464-471. See also: Imhof, H.K., et al. 2017. Spatial and temporal variation of macro-, meso- and microplastic abundance on a remote coral island of the Maldives, Indian Ocean. Mar Pollut Bull. 2017 Mar 15;116(1-2):340-347.

²²² Tyres contain up to 30% plastic resins and/or textiles.

²²³ Kole. P.J. at al. 2017. Wear and Tear of Tyres: A Stealthy Source of Microplastics in the Environment. Int. J. Environ. Res. Public Health 2017, 14, 1265; doi:10.3390/ijerph14101265.

²²⁴ <https://raajje.mv/93507>.

6.2.1 Policy and planning

The Constitution of Maldives (2008) states that it is a “fundamental duty of the state to protect and preserve the biodiversity, resources and beauty of the country for the benefit of present and future generations’ as well as ensuring every citizen has the right to a safe environment”. The Maldives aspiration for environmental protection and conservation is set out in the Vision 2020 statement.²²⁵

Policies

In 2008, a national policy on solid waste management was approved.²²⁶ It sets out quantitative targets and how generic principles of waste management (polluter pays, waste hierarchy, BATNEEC and others) will be implemented in Maldives, defines key waste management terms and governance modalities at national, island and atoll levels. It sets out strategic actions across 11 policy areas:

- coordinate and align the roles and responsibilities of public bodies at national, regional and island levels and support implementation capacity
- engage waste producers with regard to their duties and responsibilities
- subsidiarity – waste to be managed at the lowest possible level as far as practicable (e.g. household, community, island, atoll) with higher level provisions for recycling and for disposal of waste which cannot be adequately disposed of at local levels (e.g. regional managed landfill or other appropriate approach).
- provide for effective management of special wastes and discourage noxious products
- sound information basis for plans
- financial viability of the waste management system
- consolidate the relevant legislation
- engage the private sector
- introduce financial incentives to promote more sustainable behaviours
- raise awareness.²²⁷

In 2015, an updated policy makes reference to additional principles, such as those underpinning EU policies.²²⁸ These include the 3Rs (reduction, reuse, recycle), EPR and waste to energy. The policy describes 16 strategic actions, including:

- regulations and incentives for re-use and recycling
- further specification of waste management responsibilities
- development of legislation for a deposit refund system for P.E.T. bottles
- development of a national information system for waste management
- measures to implement the polluter pays principle including through waste management fees

²²⁵ See also: Republic of Maldives Ministry of Environment and Energy, National Biodiversity Strategy & Action Plan 2016–2025 (NBSAP) (2015).

²²⁶ Ministry of Environment, 2008. National Solid Waste Management Policy for the Republic of the Maldives. Ministry of Environment, Energy and Water. Environment Research Centre, UNDP. Malé, Maldives. January 2008. This is understood to have been partly based on an older framework: Government of Maldives, Ministry Environment Energy and Water. National Framework for Solid Waste Management in the Maldives. United Nations Development Programme.

²²⁷ <https://www.facebook.com/environment.gov.mv/videos/1403271556677615/>

²²⁸ National Waste Management Policy (2015) <https://www.environment.gov.mv/v2/en/download/4584>. The Ministry of Health with the assistance of the World Health Organisation developed a National Health Care Waste Management Policy and Strategy (2015-2021).

- modalities for waste management infrastructure development (criteria, location, scale)
- determines 7 regional waste management 'catchment' areas for provision of selected regional services
- development of appropriate technologies
- financing modalities, including consideration of a waste management fund and EPR.

A Clean Blue Maldives Charter, endorsed by the office of the President, committed parties to a range of specifically actions to prevent, reduce and manage plastic waste.²²⁹ Several policy initiatives, generally backed by legislation, have been put in place to ban certain types of plastic bags; to reduce the use of plastic bottles (including an import tax on PET resin) and food containers; and more recently to eliminate single-use-plastics. In 2019, the parliament passed a resolution to ban single-use plastics in Maldives from 2025. A national Plastic Committee comprising government and civil society representatives was established by the Ministry of Environment and developed a Single Use Plastic (SUP) phase-out policy with the following elements:²³⁰

- bans on the import, production and sale of specific SUP products
- market based instruments (import tariffs and consumer levies, support for local SUP substitutes)
- strengthened national waste data and setting reduction targets for plastic packaging
- extended producer responsibility (EPR) including deposit refund system (DRS) environmental product design, separate collection, and end-of life management of single-use plastic
- strategies for sustainable provision of alternatives
- education and awareness.

In December 2020, Law No:31/79 (Export-Import Act of Maldives) was amended to enable listing of SUP products to be phased out. These measures come into effect in mid-2021. Other relevant policy instruments include the National Water and Sewerage Policy (2017).

Maldives is party to the relevant international conventions on waste management and has the required action plans and other measures, e.g., for medical waste, for dangerous chemicals, and for implementation of obligations under international conventions (e.g. Basel, Bamako, mercury). The responsibilities of the various actors have been described above. A cross ministerial process, including CSO actors and WAMCO, have been involved in alignment of policies and plans with the SDGs.

Plans

The plans essentially implement the policies described above and deploy a comprehensive array of initiatives, including: institutional and infrastructure development, education and awareness; legislation; fiscal measures; engagement of the business community and civil society; support for a circular economy; and leadership in international campaigns. A number of investment projects are of note:

- Environmental Management Project (World Bank, P108078) 2008 (\$15.6m)
- Maldives Clean Environment Project (World Bank, 2016)
- Greater Malé Environmental Improvement and Waste Management Project (ADB/ Japan Fund, GoM, 2018) (\$40m loan) addresses SWM in the Greater Malé region. Phase II is expected to

²²⁹ See also: Maldives Parliament Resolution of 2019 and the Presidential declaration at the 74th session of the UNGA in 2019. <https://presidency.gov.mv/Press/Article/22264>

²³⁰ Nashfa, H. 2019. Single Use Plastic Phase-out policy for Maldives 2020-2023 (draft). Ministry of Environment. Republic of Maldives. See also: Duvat, V.K.E., Magnan, A.K. Rapid human-driven undermining of atoll island capacity to adjust to ocean climate-related pressures. *Sci Rep* 9, 15129 (2019). <https://doi.org/10.1038/s41598-019-51468-3>.

address the rehabilitation of the Thilafushi dumpsite, including through a 'waste-to-energy' 8MW facility (total cost est. \$150m)²³¹

- Urban Development and Resilience Project (World Bank, 2020) will finance sewage treatment and stormwater management schemes which may contribute to reduced MPP.
- The EU-supported 'switchasia' programme focuses on SDG 12 "Sustainable Consumption and Production" (SCP). In 2020 a specific financing window for single-use plastics in the tourism sector was developed by the SCP Facility and approved by both the government and the EU Delegation.²³²
- USAID Clean Cities Blue Oceans.

The World Bank-financed Maldives Environmental Management Project (2008-2016) supported development of Island Waste Management Centers (IWMCs) in four atolls of the North central region (12 out of 22 islands) where waste was segregated and 30 percent of the organic waste was composted. Island Waste Management Plans (IWMP) were endorsed by the Island Councils and approved by the EPA for 22 islands. Although the internal success rating of the project was judged 'unsatisfactory', importantly, the project established a range of economic and logistic metrics for island waste management; the costs associated with local collection and transport to IWMCs; and the distribution of costs between households, island administrations, resorts, WAMCO and others.²³³ In addition, the project provided a field-level assessment of the environmental risks associated with construction, waste transportation, treatment and operations of SWM in fragile atoll ecosystems. It also provided a basis for mapping alternative logistics and cost structures, the modalities for cooperation between multiple stakeholders and the institutional requirements (legislation, corporate engagement, incentives) for waste reduction and reuse/ recycling.

The Maldives Clean Environment Project (World Bank, P160739) aims to support the implementation of the national SWM strategy at national level through instituting or improving planned measures (e.g. on SUP, EPR, fiscal measures, tariff regimes, user charges); through environmental and economic analyses; and capacity building. It also targets establishing the functional effectiveness of the SWM system in Zones IV and V, in particular with respect to the IWMCs and RWMCs, managed by WAMCO (Zones II, IV and V).

In Zone VI a Regional Waste Management Strategy and Action Plan identified priority strategies and practical actions to be achieved 2019-2023 by addressing key issues, needs and challenges in implementing the national solid waste policy at regional and island levels.²³⁴ The actions envisaged included: (i) efforts to maximize public awareness, waste separation, proper collection, composting and temporary storage of recyclables and residuals at the island level; and (ii) at the regional level, to improve appropriate technologies and infrastructure, sustainable financial systems, institutional building and private sector involvement.²³⁵

²³¹ Ministry of Environment, 2020. Environmental Impact Assessment Thilafushi Dumpsite Rehabilitation. Greater Malé Waste-to-Energy Project (Phase 2, Outcome 2), July 2020. See also: Saleem, A. 2018. Environmental and Social Management Plan for the Establishment of Island Waste Management Centre in Th. Thimarafushi. Ministry of Environment and Energy.

²³² <https://www.switch-asia.eu/countries/south-asia/maldives/>.

²³³ Cost of transport from IWMCs to RWMCs can be as much as 50% of the total SWM costs.

²³⁴ A collaboration between the Ministry of Environment, IGES, UNEP supported by Japan's Ministry of Environment.

²³⁵ Gamaralalage, P.J.D. et al. 2019. Regional Waste Management Strategy and Action Plan for Zone 6 in Maldives. Ministry of Environment, Maldives. <https://www.ccet.jp/publications/regional-waste-management-strategy-and-action-plan-zone-6-maldives>.

A number of other plans are of relevance to MPP:

- Ministry of Environment, 2016. National Biodiversity Strategy and Action Plan of the Maldives 2016-2025
- the Strategic Action Plan (2019-2023) makes specific reference to waste as a resource; to enforce the phase out of importation, production and use of single use plastics; and to develop and implement a national recycling strategy for plastics and other recyclables
- Fifth Tourism Master Plan (2019) aims at a substantial increase in the number of beds and to improve the governance framework and in particular the regulation of the guest-house segment.

6.2.2 Regulation.

Selected legislation of relevance to MPP is listed below (Box 8 and Box 9).²³⁶

Box 8. Selected legislation related to MPP

Environment and pollution

- Environmental Protection and Preservation Act of Maldives (Law No. 4/93) Basic and associated regulations notably the EIA regulations Environmental Impact Assessment Regulations (2007)
- Regulation on the Preparation of Environmental Impact Assessment Report 2012 (No. 2012/R-27)(EPPA)
- Environment Protection and Preservation Act of Maldives, 1st Amendment (on institutional arrangements)
- Waste Management Regulation (2013/R-58). Each island is required to have its own waste management site that is approved by the EPA
- Sewage Disposal Regulations 1996.

Tourism

- Maldives Tourism Act (Law No. 2/99)
- Regulation on the Protection and Conservation of Environment in the Tourism Industry 2006 (incl provisions on waste management and sewage).

SUPs, plastic bags and bottles

- Single-Use Plastic Phaseout Regulation in 2020
- Producer Responsibility on Packaging Regulation

²³⁶ For a description of the relevant legislation see the following: Ministry of Environment and Energy, 2016. Maldives Clean Environment Project Environmental and Social Assessment and Management Framework (ESAMF) & Resettlement Policy Framework (RPF). https://ewsddata.rightsindevelopment.org/files/documents/39/WB-P160739_z4NesDM.pdf; Techera, E. and M. Cannell-Lunn 2019. A review of environmental law in Maldives with respect to conservation, biodiversity, fisheries and tourism. Asia Pacific Journal of Environmental Law. November 2019, 22(2):228-256.

Box 9. Regulation on waste management in the tourism sector

Section 5 of the Regulation on the Protection and Conservation of Environment in the Tourism Industry (Maldives Tourism Act, Law No. 2/99) addresses the provisions concerning solid waste management for the tourism sector. Among the requirements of the regulation are:

- waste collection bins with lids are to be placed for convenient use on leased tourist properties such as resorts.
- the components of discarded wastes (food, glass, metals, toxic or hazardous materials) are to be separately collected.
- waste disposal is to be done in a manner that will have the least impact on the environment.
- all tourist resorts are to have and use incinerators, compactors and bottle crushers.
- waste is to be disposed in the designated area or, in the absence of a designated area, disposed in a manner that is least harmful to the environment.
- waste burning is only to be done in an incinerator, which means open burning is prohibited.
- combustibles such as plastics that may produce noxious emissions are not to be burned but rather separately collected and delivered to a designated waste management area.
- monitoring data on vessels, including the capacity and proper logs on trips made for waste disposal in an island or part of it leased for tourism purpose, are to be maintained.
- tourist vessels such as safari boats are to have a system for waste collection and storage until such waste can be taken to a designated place for waste

The EPPA regulation, implemented by the Environmental Protection Agency (EPA) addresses five main waste management areas: (i) definition of standards for waste collection, transfer, treatment, storage, waste site management, landfills and managing hazardous waste; (ii) procedures for waste site permit approvals; (iii) standards and permits required for waste transport on land and sea, including trans-boundary movements; (iv) reporting and monitoring requirements and procedures; and (v) procedures to enforce waste management regulations.

6.2.3 A national MPP action plan?

A national action plan on MPP could readily be prepared as a synthesis of elements of the existing strategies and plans, as the key components already exist. A specialised MPP working group, or task force could be established to consolidate these elements, determine how they can best be aligned, and identify any gaps. The closely related development of the circular economy may require an additional and more industry/ innovation/ investment- targeted working group.

A strategic action plan on MPP could include some or all of the following elements:²³⁷

- anchoring the action plan in existing policies, plans, legislation and institutions
- establishing more precisely the scale of MPP (including microplastics) and the main causes and the responsibilities for addressing those causes
- complement the vision of a low/no plastic waste society by identifying long-term aspirational goals, immediate and longer-term actions, supporting key investments and means of coordination, monitoring and review

²³⁷ See: EPA, 2018. Maldives Marine Litter Action Plan, Maldives.

- evaluate existing levels of awareness and inform planned national awareness campaigns and the work of the CSOs and business community, including in relation to public perception on the costs and benefits of different actions the allocation of costs between consumers, business and government
- further development and application of codes of conduct to reduce plastic waste and MPP, e.g. through tourism organisations, cruise lines, dive centres, supermarkets, beach users and fisher associations
- developing an 'all-of- business' approach through engagement of all businesses to ensure reduction, reuse and recycling, including the application of EPR schemes, fiscal measures and promotion of schemes for use of renewable containers, e.g., for shampoos, detergents, water
- baseline studies to establish the economic impacts of MPP
- identify the resources and financing which may be required to bridge any gaps, to consolidate activities or initiate any catalytic measures required
- consider further regional initiatives, including on exploring opportunities for harmonised regional product bans or 'environmental import tariffs', exploring regional 'agreements' with major soft drinks suppliers for economies of scale in regional EPR and recycling (see 6.3.8).

6.2.4 Fisheries

There are basically two types of fisheries in Maldives: the tuna fisheries use lines and small-mesh nets (for bait-fishing); the 'reef/ lagoon' fisheries use both lines and nets. The Olive Ridley project removed over 730 lost nets (July 2013 - June 2017). The origin of the nets was unclear, but were very unlikely to be from the Maldives tuna line fisheries. Maldives licenses over 800 traditional fishing vessels and requires licensed fishers to collect any drifting plastics encountered. The debris is then handed over to designated collection points (e.g. at fish processing plants) and delivered to Parley for the Oceans for recycling to yarn or fabrics.²³⁸

FADs are likely to be a source of marine debris from the tuna fishery, as about 50 anchored FADs are used in Maldives and many other drifting FADs throughout the region. Approaches to reducing MPP from FADs are under study or being implemented in Maldives and in other regions.²³⁹ There are complete records of anchored FAD losses and recovery in Maldives. Assuming that 10 percent of drifting FADs are lost by the purse seine fishery (not operational in Maldives), it is possible that about 2,450 FADs may be lost annually in the IOTC region.²⁴⁰ Analyses of beach litter in the region suggests that both ships garbage and lost fishing gear from Asian fishing vessels can contribute significantly to MPP, even if not fishing in the Maldives EEZ.

A series of regional workshop (2019) indicated a generally low level of awareness on the scale of lost or abandoned gear and nature of appropriate solutions.²⁴¹ Workshops have been held, but it is unclear to what extent best practices are implemented in Maldives, or regionally. Given the nature of the fisheries in Maldives, comprehensive marking of fishing gear may not be practical, except for nets set

²³⁸ <https://www.parley.tv/#fortheoceans>

²³⁹ IPNLF, 2016, Fish Aggregating Device Management, IPNLF Issue Brief; Baske, A. et al. 2019. Options for Improving dFAD Recovery and Accountability to Minimize Marine Coastal Habitat Damage and Marine Litter. nsuworks.nova.edu; Moreno, G. et al. 2018. Moving away from synthetic materials used at FADs: evaluating biodegradable ropes degradation. *Collect. Vol. Sci. Pap. ICCAT 74 (5)*, 2192-2198.

²⁴⁰ Adam, M. Shiham, 2019. Use of Anchored FADs in the Maldives – Notes for a Case Study for Assessing ALDFG. IOTC-2019-WPTT21-58.

²⁴¹ Macfadyen, G., Huntington, T., and Cappell, R. 2009. Abandoned, lost or otherwise discarded fishing gear. UNEP Regional Seas Reports and Studies No.185; FAO Fisheries and Aquaculture Technical Paper, No. 523. Rome, UNEP/FAO. 2009. 115p.; FAO 2020. Report of 2019 FAO Regional workshops on best practices to prevent and reduce abandoned, lost or discarded fishing gear in collaboration with the Global Ghost Gear Initiative. FAO Fisheries and Aquaculture Report No 1312. Rome. <https://doi.org/10.4060/ca9348en>.

near marine parks or prime tourist/ dive sites, or where volunteer divers can be used for recovery.²⁴² For larger, 'port-based' vessels, reception facilities based on MARPOL Annex V requirements could be applied to fishing vessels.²⁴³

Reduction of MPP from foreign fishing vessels requires a regional approach, particularly as foreign vessels generally do not make port calls to Maldives. This could start with resolutions by IOTC and SEAFO, possibly phasing in MARPOL Annex V requirements for vessels; introducing measures with respect to marking gear and FADs; and specifying responsibility for recovery of lost gear. Enforcement could be through the PSMA. Appropriate requirements could eventually become part of minimum terms and conditions of access, included in licenses for vessels and could be an approved regional management measure. Fisheries support vessels could be included in such a scheme. FAO could be requested to provide support for design of a phased approach and the issue could be raised in the context of any future EU fisheries access agreement. EPR schemes for waste fishing gear may require the economies of scale which may only be feasible through regional schemes (e.g. catalysed by SWIOFC, IOTC, or the International Pole & Line Foundation (IPNLF)), through close engagement with businesses and possibly with economic support from EPR arrangements with importers.

Although many small-scale fishing vessels are wooden, fibreglass (GRP) fishing vessels and other GRP vessels will progressively reach the end of their useful life. Abandoned GRP vessels present a growing plastic waste problem and are likely to progressively degrade to marine microplastics if abandoned. Most countries have no provision for appropriate disposal of GRP vessels. Rules for their disposal are required and the responsibilities specified. Measures could include a requirement that the annual vessel registration fee is paid until appropriate disposal is certified. EPR schemes may be difficult to design given the extended life of these boats.

6.2.5 Shipping and tourism

Ensuring that Maldives meets its obligations under MARPOL Annex V is the key action required. Maldives Ports Ltd. is responsible for all Maldives ports. Dialogues with vessel operators and ships agents can help in separation of recyclables in ship's garbage.²⁴⁴ Dialogues with IMO and regional port authorities could help ensure coordinated measures to prevent dumping of waste by shipping in the region and to foster codes of conduct for regional shipping lines.²⁴⁵ MARPOL Annex V also applies to the disposal of garbage from fixed or floating platforms engaged in the exploration or exploitation of seabed oil and gas and should be stipulated in the relevant authorisations.²⁴⁶

The regulations applying to tourist resorts have been described above (Box 8). Tourism is recognised as a significant regional source of MPP and the target of the regional Prevention of Marine Litter in the Lakshadweep Sea (PROMISE) project (Box 10).

²⁴² Small-scale fishers often create local or 'proprietary' systems of marking fishing gear to prevent theft, or help in the recovery of lost gear.

²⁴³ Huntington, T.C., 2016. Development of a best practice framework for the management of fishing gear. Part 2: Best practice framework for the management of fishing gear. Confidential report to World Animal Protection; Also see the Global Ghost Gear Initiative.

²⁴⁴ A wide range of IMO guidelines are available: Prevention of Pollution by Garbage from Ships <https://www.imo.org/en/OurWork/Environment/Pages/Garbage-Default.aspx>; Resolution MEPC.220(63) Guidelines for the Development of Garbage Management Plans; 2017 Guidelines for the implementation of MARPOL Annex V. <https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/MEPC.1-Circ.834-Rev.1.pdf>; IMO, 2018. Consolidated guidance for port reception facility providers and users. <https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/MEPC.1-Circ.834-Rev.1.pdf>.

²⁴⁵ UK Chamber of Shipping, 2020. Best Practice on combatting Single-Use Plastic in Shipping; Carnival Corporation & PLC, 2019. Sustainability from Ship to Shore FY2019 Sustainability Report.

²⁴⁶ Some exploratory drilling has taken place, e.g. in the Kardiva Channel/ Goidhoo Atoll area.

Box 10. Prevention of Marine Litter in the Lakshadweep Sea (PROMISE) project

The rapidly expanding tourism in Maldives, Sri Lanka and India tourism industries has been identified as a significant contributor to marine litter and MPP in the Lakshadweep Sea largely due to high consumption rates of convenience products wrapped in single-use plastic packaging.

The PROMISE project (2020-24) is part of the SWITCH-Asia II, an EU-supported initiative to promote Sustainable Consumption and Production (SCP). The project targets the prevention and leakage of wastes from land-based sources into the Lakshadweep Sea. The project partners include the Maldives National University, Parley for the Oceans and others.

The objective of PROMISE is to promote source-to-sea solutions to reduce marine littering in tourism clusters along the Lakshadweep shorelines of the Maldives, Sri Lanka and India with a particular focus on waste minimisation in small and medium tourism enterprises (MSMEs). PROMISE will:

- establish a knowledge base for the status quo of marine littering in tourism clusters along Lakshadweep shorelines
- conceptualise and initiate a “Lakshadweep Zero Waste Alliance”
- strengthen regional policy frameworks for waste management in coastal areas and contribute to reduced waste generation and littering in all three target countries
- inform wider stakeholder network about the approaches to waste prevention
- promote regionally integrated source-to-sea solutions to reduce marine littering in tourism clusters and strengthen the position of micro, in the tourism cluster and of regional governance mechanisms
- use the Resource Efficient Cleaner Production (RECP) approach and the Avoid. Intercept. Redesign. (AIR) scheme developed by Parley for the Oceans
- support zero-waste business models and operations through knowledge exchange, access to finance and improved supply chains and governance.

<https://www.switch-asia.eu/project/promise/>; <https://projectpromise.eu/>

<https://www.adelphi.de/en/project/prevention-marine-litter-lakshadweep-sea-promise>

6.2.6 Circular economy

Maldives is committed to a circular economy (CE). For example, in 2015 Maldives hosted the Asia Pacific 3Rs (Reduce Recover Recycle) Forum and strengthened the link between the 3Rs Initiative and the SIDS SAMOA Pathway.²⁴⁷ The companion report on circular economy, prepared under this project, also provides additional perspectives.

Single-use plastics have been banned in some offices and all school premises. Some cafés and restaurants in the capital have also stopped using straws and plastic bottles. Many tourist resorts, NGOs and government initiatives are pro-active in support of circular economy or related initiatives.

PET bottles are collected and extensively recycled for export.²⁴⁸ However, a new water bottling plant that will produce 10,000 plastic bottles every hour is being set up in Kulhudhuffushi.²⁴⁹ Recorded

²⁴⁷ For details see: 3R as an Economic Industry- Next Generation 3R Solutions for a Resource Efficient Society and Sustainable Tourism Development in Asia and the Pacific. <https://www.env.go.jp/recycle/3r/en/index.html>; <https://www.env.go.jp/recycle/3r/en/results/10.html>

²⁴⁸ Nashfa, Hawwa. 2016. Implementing a Deposit Refund System for P.E.T bottles in the Maldives. An ex-ante analysis of political feasibility based the models of Kiribati and Palau. Thesis, IIIIEE, Lund, Sweden.

²⁴⁹ Reportedly by Malé’ Water and Sewerage Company (80% government-owned) and Island Beverages Maldives.

exports of waste plastic were 434 tons (\$58,000) in 2017, but lower in 2018.²⁵⁰ In 2015, through a concessional loan of about \$6 m, the Abu Dhabi Fund for Development (ADFD) is supporting a waste-to-energy project to incinerate an estimated 55,000 tons of waste per year and provide power to Vandhoo, Addu and Kulhudhuffushi.²⁵¹

Occupancy at Soneva Jani resort is often the highest in the Maldives. The resort is committed to development the most sustainable way possible. This includes using sustainable materials, recycling waste, eliminating plastics, conserving water, and preserving and protecting the local ecosystem. For example, water is supplied in reusable glass bottles, filled with water made at the island's reverse-osmosis plant. Shampoo and shower gel is delivered in large 5-gallon tubs that are used to fill ceramic bottles that are refilled when empty.²⁵²

In common with several other AIODIS countries Maldives has a number of CE constraints. These include: high cost of collection and transportation of the wastes; relatively high cost of labour, energy; a weak manufacturing base; shortage of technical skills; and fragmented internal tourist and Maldives resident's markets. Several reports outline generic and alternative approaches to re-use and recycling, including the technical, economic and financing issues and lessons from Asia and small island economies.²⁵³

6.2.7 Awareness of MPP

Maldives has ratified MARPOL Annex V and enacted national legislation on plastic bag and SUPs. Maldives has a high level of engagement in a range of international initiatives on MPP, or marine litter (see regional initiatives below). Maldives is not party to the Nairobi Convention.

During the preparation of national and regional SWM plans, there has been extensive collaborative studies, peer-learning, consultation with the participation of stakeholders at national, regional and island levels and with business and civil society groups. This has contributed to a broad understanding of SWM and the 'plastics problem'.²⁵⁴

Specifically, a wide range of awareness activities on waste management in general and on management of plastic waste have already been undertaken in Maldives (e.g., Box 11). Awareness activities are supported as part of the core strategic actions under the national SWM plans and are executed by government agencies, responsible businesses (including the tourism sector) and be a range of civil society organisations (Box 12).

²⁵⁰ Comtrade HS code 3915. No data available for 2019 and 2020. Maldives Custom Service (2015): Quality and Value of Recycle Materials, Statistics 2015. <https://www.customs.gov.mv/Statistics>.

²⁵¹ <https://waste-management-world.com/a/abu-dhabi-backed-4mw-waste-to-energy-project-to-move-forward-in-the-maldives>.

²⁵² <https://soneva.com/soneva-jani>

²⁵³ Lachmann et al. 2017. Marine plastic litter on Small Island Developing States (SIDS): Impacts and Measures. Appendix 3: Details for initiatives that (re-)use plastic litter; Weekes, J.G. et al. 2020. Solid waste management system for small island developing states. Global Journal of Environmental Science and Management (GJESM) <https://www.gjesm.net/>; UNCDR, 2020. UNCRD 10th 3R Forum. State of Plastics Report. <https://sdgs.un.org/documents/uncrd10th-3r-forumstate-plastics-report-25105>

²⁵⁴ E.g., see: <https://internationalwasteplatform.org/say-no-to-open-plastic-burning-2/>

Box 11. High-level engagement on 'grass-roots' issues

The Maldives First Lady, spoke on the Maldives' Single Use plastic phase out plan, which comes into effect on 1 June 2021. The First Lady reflected on several challenges:

- the success of the plan relies upon commitment towards shaping policies, regulations and the enforcement as well as behavioural changes to adapt over time.
- some lifestyle changes that can be brought through simple actions such as carrying reusable water bottles, reusable bags
- taking 'Tupperware' to buy hedhikaa (snacks)
- make it 'fashionable' to exchange used clothing to reduce waste and use of synthetic textiles
- get involved in clean-up activities
- pick up waste where and when possible
- speak out against littering or dumping of waste
- encourage friends and family to adopt some of these life style changes
- participate in dialogues to find solutions for the disposal of waste in a responsible manner.

Adapted from : <https://presidencymaldives.gov.mv/Press/Article/24269> (25/01/2021).

Recently (January 2021), the Maldives Ocean Plastics Alliance (MOPA) launched the 'Plastic Reverse Logistics Project' which draws together an alliance of PET bottle manufacturers, importers, retailers, distributors and end-users of PET bottles, as well as regulators and policymakers. The project will collect PET bottles from over 120 retail outlets for recycling through the Parley Maldives initiative.²⁵⁵ The Biodiversity Environment Awareness Maldives (BEAM) also has a collaborative effort with Parley Ocean School to implement an 'Avoid. Intercept. Redesign' (AIR) strategy. BEAM collects and exports about one 40-foot container of waste PET bottles a week. The recycled plastic is used for manufacture of sports gear by Adidas, including kits for major professional sports teams such as FC Bayern Munich, Real Madrid and Manchester United FC. Parley Ocean Schools is a youth-driven resolution to ban single use plastics was approved by parliament on July 4, 2019. Parley Maldives has introduced plastic interception and baling sites in island communities and more than 70 schools; collaborative cleanups on affected coastlines; and the recycling center and innovation lab in Malé.²⁵⁶

²⁵⁵ Maldivian Times, January 25, 2021. <https://maldiviantimes.com/environment-minister-launches-mopas-flagship-plastic-reverse-logistics-project/>.

²⁵⁶ <https://www.parley.tv/updates/parleymaldives?rq=maldives>.

Box 12. 'National Best Practice Example' award for waste management

Hoandedhoo Island Development Society, a local NGO, secured funding for a waste management project concept under the Mangroves for the Future Small Grant initiative.

Community and Island Councils consultations and a door-to-door campaign developed a participatory plan for the management of waste in the islands based on education and inclusion. This was backed by town hall meetings and training workshops including on awareness of the importance of separating different types of waste. Surveys of households' willingness to pay provided a basis for local council waste charges to support waste collection services and transfer to waste management centres.

To foster leadership and sustainability, the Island Council set up a community committee to oversee the WM system and secure additional resources for waste bins and further training (e.g. in composting). A government-built waste management centre was built on one island.

In a similar initiative, residents on the island of Maalhos restricted the use of plastic water bottles, built a small recycling centre to separate plastics from other solid waste for reuse, and introduced a glass water bottling centre that is now a thriving business enterprise.²⁵⁷

Source: <https://www.iucn.org/news/asia/201801/garbage-garbage-out-waste-management-maldives>
Mangroves for the Future (MFF) is a partnership-based regional initiative.

Studies on awareness provide useful insights. In Ukulhas (Zone III), 97 percent of respondents in a 2016 study, acknowledged that fees should be paid for waste collection services, and 80 percent of respondents across all educational groups were aware that plastic was harmful to the environment. However, despite this, only 50 percent were willing to use recyclable shopping bags, while 31 percent were unwilling. Statistically, there was no association between people who think plastic was harmful and their willingness to use recyclable shopping bags.²⁵⁸

Other awareness instruments include:

- Saafu Raajje campaign (2015)
- National Biodiversity Strategy and Action Plan 2016-2025
- Save the Beach
- International Coastal Clean-up Day
- Maldives Marine Litter Acton Plan²⁵⁹
- Korallion Lab (scientific level)

6.2.8 Regional initiatives

Maldives can potentially benefit from regional initiatives directed at the WIO and at South Asia. On the environmental front, Maldives is a participant in the Bay of Bengal Programme and a member of South Asia Cooperative Environment Programme (SACEP). Several studies and the SACEP country reports review the status of MPP and marine litter in South Asia.²⁶⁰ The Regional Marine Litter Action Plan for

²⁵⁷ <https://blogs.worldbank.org/endpovertyinsouthasia/world-oceans-day-south-asia-launches-new-initiative-fight-plastic-pollution>.

²⁵⁸ Shadiya, F. 2016. Effectiveness of Solid Waste Management in the Maldives: A Case Study from Ukulhas. Thesis, Villa College, February 2016.

²⁵⁹ EPA, 2018. Maldives Marine Litter Acton Plan, Maldives. Environmental Protection Agency.

²⁶⁰ SACEP, 2018. Regulating Marine Litter and Plastic Wastes in the South Asian Seas Region; Kapinga, C.P and S.H. Chung, 2020. Marine Plastic Pollution in South Asia. UNESCAP.

South Asian Seas Region provides a comprehensive framework for action.²⁶¹ This is supplemented by a 'roadmap' that sets targets for 2030. The targets are linked to SDGs and specify a phase-out of single-use plastics; all plastic packaging to be either recyclable, reusable or compostable; and a reduction in MPP of all kinds.²⁶² The high level of regional plastic pollution attributable to rivers is addressed through a regional project which is partly based on the Regional Marine Litter Action Plan (Box 13).

Box 13. Regional project: Plastic free Rivers and Seas for South Asia

The objective of the Plastic Free Rivers and Seas for South Asia Project is to strengthen innovation and coordination of circular economy solutions to plastic pollution flowing into South Asian Seas. The project is supported by the World Bank and implemented by SACEP.

The Project has three components. Component 1 provides competitive block grant investments to reduce plastic waste through investment in a circular plastic economy solutions and disseminate knowledge of solutions. Component 2 leverages public and private sector engagement and solutions to develop and/or improve national and regional plastic pollution mitigation strategies, action plans, policies and industry standards.

The project will support development of: enabling policies, standards, analytics to enable strategies and action plans to harmonize plastic pollution mitigation measures. It will develop and implement a multi-year plastic policy support program including through leading universities and organizations; develop databases for lifecycle analysis, data collection, and modelling in selected industry value chains; and support communication activities. It will enable regional PPPs for a regional circular economy for plastics.

Closer regional institutional alignment is also envisaged through an Inter-Regional Organization Dialogue Committee, initially comprising SACEP and IORA.

Source: <https://projects.worldbank.org/en/projects-operations/project-detail/P171269>.²⁶³

<http://www.sacep.org/programmes/plastic-free-rivers-and-seas-for-south-asia>

As already noted (Box 10), from 2021, the 'Prevention of Marine Litter in the Lakshadweep Sea' (PROMISE) project will address marine littering in tourism clusters in the Maldives, Sri Lanka and India. The Bay of Bengal Large Marine Ecosystem Project is another relevant regional initiative.

With regard to economic and trade dimension of MPP, Maldives is a member of the South Asian Association for Regional Cooperation (SAARC) and the Indian Ocean Rim Association (IORA). In relation to the circular economy, Maldives is party to the Regional 3R Forum in Asia and the Pacific which promotes a range of policy and technical approaches to address plastics in the circular economy (Box 14).

²⁶¹ SACEP (2019). Regional Marine Litter Action Plan for South Asian Seas Region. South Asia Co-operative Environment Programme, Colombo. Based on a review of marine litter challenges in five coastal states (Bangladesh, India, Maldives, Pakistan, and Sri Lanka) and in the region,

²⁶² SACEP, 2019. A Roadmap for Sustainable Waste Management and Resource Circulation in South Asia, 2019-2030. The Roadmap was developed with the support of the Ministry of Environment, Japan through UNEP IETC.

²⁶³ SACEP, 2019. A Roadmap for Sustainable Waste Management and Resource Circulation in South Asia, 2019-2030. The Roadmap was developed with the support of the Ministry of Environment, Japan through UNEP IETC

Box 14. Key messages from the 2014 3R Forum

- Wastes and emissions are intrinsically linked with overall resource use; natural resources and ecological assets are being used at increasing rate enabling economic growth and fuelling unprecedented grow of cities;
- The goal of improving resource efficiency and reducing the waste and emission intensity for Asia-Pacific economies has become a significant driver of government policies and programs;
- Establishing new forms of cooperation and partnerships between govt., business, community will underpin successful implementation of 3Rs.
- 3R needs to be linked to other policy domain such as climate mitigation and adaptation, energy and water security, urban air pollution, and supply security of critical natural resources.
- Eco-parks and eco-towns need to encompass a range of eco-initiatives including biodiversity and resource efficiency and promote it across the region.
- Triangular cooperation (Govt-Scientific-Private) is key to develop viable and effective business models in 3Rs and waste management.
- Establishment of research, innovation and practice (RIP) parks in the region should be established and support Waste to Resource (W2R).
- Sustainability and resiliency of cities, and thereby the role of 3Rs, are critically important in post 2015 development agenda.
- 3R+R (reduce, reuse, recycle and return), regional cooperation and partnerships are key to sustainable waste management in Small Island Developing States (SIDS). Plastic litter is a major pollution issue in coastal and marine environments of SIDS and needs special attention. Integration of 3R in regional programmes dealing with climate change, disaster management, and biodiversity management should be considered as a priority

Source: 5th Regional 3R Forum in Asia and the Pacific, 2014

While Maldives already has significant engagement in regional efforts to combat MPP, in the context of AIODIS, Maldives could consider:

- linkage of the Nairobi Convention actions to those of the SACEP Regional Marine Litter Action Plan
- cooperation in preparation of a funding submission for a regional MPP monitoring programme, including MPP from distant sources, collating information on beach clean-ups through existing initiatives, and preparation of a strategic plan on MPP

Maldives could consider contributing to a common AIODIS position on MPP, possibly with a view to consolidating actions and positions through existing initiatives, such as SIDS and IORA. Such engagement could also contribute to the oceans agenda of UNGA and UNEA.²⁶⁴ There is also scope for alignment of the SACEP plan with any WIO initiatives.

In the plastics economy sphere, Maldives could also consider initiating a dialogue in the South Asian Association for Regional Cooperation (SAARC) on trade issues related to MPP and plastic waste management in general. In particular, regional arrangements on trade in plastic waste (and other recyclable waste) would be a useful interpretation of the new Basel rules. Regional measures to reduce or eliminate un-necessary plastics, such as microbeads in household products and selected

²⁶⁴ Wienrich, N., Weiland, L., & Unger, S. (2021). Stronger together: The role of regional instruments in strengthening global governance of marine plastic pollution. IASS Study, February 2021; Carlini, G., & Kleine, K. (2018). Advancing the international regulation of plastic pollution beyond the UNEA resolution on marine litter and microplastics. Review of European, Comparative and International Environmental Law, 27(3), 234–244. <https://doi.org/10.1111/reel.12258>.

SUPs can also foster innovation in development of local substitutes. Regional initiatives could also underpin a dialogue on EPR with regional suppliers, such as agents for fishing nets, soft drinks (e.g., development of regional deposit return schemes). Regional measures also invoke market power in relation to the behaviour of major users of plastics (e.g. PET bottles), can underpin dialogues with major corporate sources of MPP (such as bottled drinks manufacturers - see main report), and inform ongoing discussion on plastic and the environment within the WTO.

The main project report provides greater detail and discussion of option for recycling of plastic waste and resourcing and financing opportunities. Reference can also be made to companion report on the circular economy (in preparation under a separate consultancy).