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Pacific Regional Report July 2021

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About the authors

Asia Pacific Waste Consultants (APWC) is a leading international environmental management consultancy specialising in the solid waste and recycling sectors. Our dedicated team of experts is passionate about improving environmental outcomes in developing and developed economies.

Disclaimer

This study only considers material flow analysis of plastic material from the household and commercial sector, tourism sector and fisheries sector as outlined below.

- Household and commercial sector households and commercial businesses (including supermarkets, stores, administration/offices, food and retail outlets)
- Tourism sector land-based tourism accommodation (including hotels, resorts, bed and breakfast establishments), air-based tourism (airlines and airports), water-based tourism (cruise ships and yachts)
- Fisheries sector domestic and international fishing vessels

The authors have taken all due care and skill to ensure that all material is accurate as of the date of this report. APWC and the authors do not accept responsibility for any loss that may arise by anyone relying upon its contents.

Limitations to study

The COVID-19 pandemic prevented the ability to undertake and deliver the project methodology as agreed upon prior to the pandemic commencing.

In addition, amendments to the method for data analysis were also undertaken. These include:

- Due to a lack of direct samples for accommodation composition data, data from other countries was applied for modelling purposes.
- Airline analysis was not impacted, as audit and flight data prior to COVID-19 was applied for all countries.
- Although COVID-19 had a substantial economic impact and potentially changed consumption habits, no substitutions were applied to the household or commercial waste composition.
- Because of a lack of direct samples for fishing gear, potential leakage estimates were calculated using two methods: 1) potential leakage of fishing gear based on the type of fishing activity, represented by a number of fishing gear items that leaked; and 2) potential leakage of fishing gear based on import data, represented in tonnes.

Countries of focus

This report considers waste disposal and plastics movement in the Pacific region. These countries include:

- Cook Islands
- Fiji
- Kiribati
- Marshall Islands
- Micronesia

- Nauru
- Niue
- Palau
- Papua New Guinea

- ronesia
- Samoa

- Solomon Islands
- Tonga
- Tuvalu
- Vanuatu

The countries of focus mentioned in this report include Fiji, Samoa and Vanuatu.

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Executive Summary

IUCN Plastic Waste Free Islands

Reduce

Improve

akage the k

plastic leakage in the ocean. the knowledge of waste generation among three islands in the Caribbean and three in the Pacific.

Repurpose

waste into commercially viable products to generate obs and income for ocal communities. Create

value chains for waste plastic usage.

Develop

a Plastic Wate Free Island blueprint to be scaled up and used by any island country or regional body.

What is the Plastic Waste Free Islands project?

With support from the Norwegian Agency for Development Cooperation (Norad), IUCN initiated the Plastic Waste Free Islands (PWFI) project in 2019, part of its global 'Close the Plastic Tap' programme. The project strives to promote an island circular economy and devise effective and quantifiable solutions to address plastic leakage from Small Island Developing States (SIDS). Most SIDS have vulnerable economies that are largely reliant on tourism and fisheries.

Aims of the project

Asia Pacific Waste Consultants (APWC) was engaged by IUCN in 2020 to undertake a National Level Quantification of Plastic Waste and sectoral Material Flow Analysis in three key sectors - household and commercial, tourism and fisheries – as stage one of the Plastic Waste Free Islands Project. The plastic waste data mapping has tracked seven plastic materials in an island-wide plastic influx and outflux format. This included assessing imports and exports at a national level to identify sources, quantities and pathways of plastic waste generated and leaked. The assessments were conducted per sector across six countries in two regions - Antigua and Barbuda, Grenada and St Lucia in the Caribbean, and Samoa, Fiji and Vanuatu in the Pacific.

Data has also been collected to provide a robust and comprehensive assessment of the plastic flows and leakages, including an overview of the waste management landscape for both regions.



APWC quantification

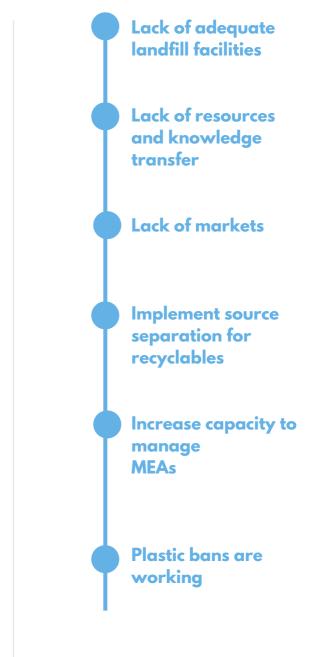
Asia Pacific Waste Consultants (APWC) gathered in-country data during 2020 in three representative Caribbean countries: Fiji, Samoa and Vanuatu. For the purpose of this report, all regional data analysis is based on these countries only. Data collection encompassed three sectors — household and commercial, tourism and fisheries, and included sampling, auditing, interviews, questionnaires and consultations. In order to consistently quantify inputs and outputs of plastic (including imports and exports) across national levels, locally sourced field-level data was supplemented with regionally focused published research and national statistical data sets.

Seven plastic categories were targeted for assessment and qualification: PET; HDPE; PVC; LDPE; PP; PS and other plastics (polycarbonate, polylactide).



Activities and assessment

- Waste disposal data from 654 households, 143 commercial premises, 55 tourism operators and 42 fishing vessels.
- Visual landfill audit of 935 trucks entering 5 landfills.
- 15 stockpile assessments.
- Disposal data supported by sectoral interviews with 944 stakeholders.
- Extensive data analysis and desktop research were also undertaken culminating in individual reports for each country. The findings of these reports were then collated, analysed, extrapolated and consequently amalgamated into a regional document.



Pacific regional snapshot

The Pacific island countries (PICs) are a collection of 22 countries and territories spread across 30,000 mostly uninhabited islands and are home to approximately 10 million people (Figure 1). The coastline of these islands combined extends to 57,797 kilometres (Andrew et al. 2019), however marine sovereignty under economic exclusion zones extends governance responsibly a further 200 kilometres to the boundary line at sea. For most countries, the marine environment is greater than the land mass which increases the vulnerability to plastic pollution. Due to their small size, geographic isolation, natural disaster vulnerability, and an increasingly diverse range of waste materials driven by urbanisation, globalised markets and lifestyle changes as a result of growing affluence, PICs face unique and significant challenges in providing sustainable waste management systems. PICs account for seven of the top 10 countries worldwide where oceans account for over 97% of sovereignty. (Degnarain & Stone, 2017)

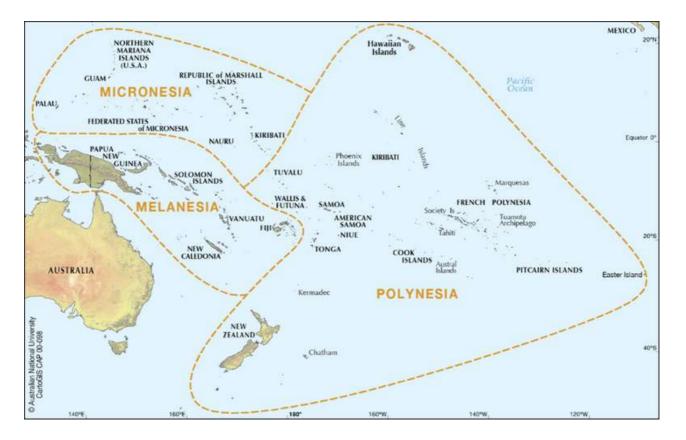


Figure 1: Map of Pacific Island Countries (PICs)



Land mass: 2% of the region is landmass





UN Country classification: Small island Developing State



Regional sectoral overview

Solid waste management in the Pacific

Solid waste management in Pacific island countries (PICs) is unique and presents significant challenges. Executing waste management methods employed by developed economies is not always practical and does not translate into PICs. At present many PICs do not have sufficient infrastructure or capacity to successfully manage the deluge of problematic waste, illegal dumping and leakage from imported materials such as single-use plastic packaging, waste oil, tyres, end-of-life vehicles and white goods. Plastic within the Pacific region accounts for 7–17% of the total waste stream, second only to organic material (35– 70%). It is estimated that 311,090 tonnes of plastic waste are generated within 50 kilometres of PIC coastlines each year, of which 73% has the potential to leak into the marine environment from littering, dumping directly into inland waterways or windblown into the ocean from uncontained disposal sites (APWC, 2020). In addition, plastic waste from other countries, carried by trade winds and ocean gyres, and other offshore sources of marine plastic pollution, such as abandoned, lost or otherwise discarded fishing gear (ALDFG), can represent the most significant types of debris on these islands (Richardson et al., 2017).

Plastic consumption and disposal across the region are creating a myriad of challenges. A lack of appropriate infrastructure and landfill space, in addition to a lack of suitable, feasible export markets, all increase the risk of plastic leakage into the environment. Reliable waste collection services are primarily only available to communities living within metropolitan areas (capital cities and major urban centres). Most people living on city fringes in peri-urban and regional, rural communities including outer islands, lack any formal waste collection services. Limited or no segregation of recyclable materials is undertaken and waste collected is disposed of in uncontrolled dumpsites and poorly managed landfills. The Cook Islands, Fiji, Palau and Tuvalu currently have mechanisms in place for source-separated collections at the household level; however, this is the exception across the region. In many instances waste services lack appropriate equipment; for example, most collection services are provided by donor-funded secondhand collection vehicles that are unable to access the majority of households due to the narrow, unpaved roads in most regional and rural communities.

Once collected, waste is disposed of in uncontrolled open dumps with no pollution control measures such as soil cover, leachate control or drainage, gas collection or means for environmental monitoring in place. The lack of containment causes a significant risk of leakage into the environment and harm to terrestrial and marine ecosystems and human health. Waste not collected is buried, burnt or dumped on land or in waterways. Most recyclables are obtained from waste pickers who operate at landfills collecting commercially valuable materials such as aluminium cans, scrap metal and e-waste. Waste pickers operate at landfills in Palau, Samoa, Vanuatu and Solomon Islands to sell to recyclers. Yet, the high cost of transport and low domestic demand for post-recycling reclaimed plastics hinders Pacific recycling. Partnerships such as the Moana Taka partnership between the Secretariat of the Pacific Regional Environment Programme (SPREP) and the China Navigation Company (CNCo) could alleviate transportation costs by taking advantage of empty cargo containers on return voyages (SPREP, 2020).

Tourism impacts

Tourism has been a major contributor to economic development within the Pacific region for many years. Tourists are attracted to the favourable weather and tropical climate, unique culture, rich biodiversity and recreational activities such as boating, snorkelling, scuba diving, hiking and general sightseeing. While tourism provides positive economic growth for island communities, the industry is also responsible for negative environmental impacts such as growing pressure on struggling waste management systems, tourist consumption of imported packaged goods and holidaying from environmental responsibilities. SPREP points out that 'waste management and pollution control remain one of the most pressing environmental issues in Pacific island countries and territories (SPREP, 2018).

The average length of stay: • Fiji – 9.6 nights

- Samoa 8.5 nights
- Vanuatu 8.1 nights

Lack of and poor waste management, in addition to a further influx of waste from tourism activities, can lead to plastics leaking and littering the environment, which is both aesthetically unpleasing and causes negative environmental impacts to terrestrial and marine ecosystems.

To ensure sustainable growth and longevity of the tourism industry the PICs will need to ensure their environments are clean, healthy and functioning. (Lachmann et al., 2017)

The financial gains achieved through tourism activities are often not balanced with the associated environmental pressures the tourism sector places on terrestrial and marine ecosystems. Limited capacity to manage the sector adequately in a sustainable fashion was highlighted when international tourism activities ceased during COVID-19, providing an opportunity for reflection on how to improve practices.

Major plastic waste issues for the household and commercial sector

Plastic consumption

is growing at a significant rate.

Lack of infrastructure

n existing waste management systems render them unsuitable to properly manage increased plastic waste material.

End markets

suffer from a lack of accessibility for ecyclable materials.

Legislation

is difficult to enforce.

Prior to COVID-19, visitor growth in the Pacific consistently increased year-on-year, however, visitor arrivals declined by 99.3% during the second quarter of 2020 across the region (SPC, 2021). During 2019, 2.9 million visitor arrivals were recorded, injecting USD 4 billion or 7.8% into the region's GDP and generating 90,821 jobs (SPTO, 2019).

During 2019, Fiji was the most popular tourist destination in the Pacific, accounting for a 39.5% share of all tourists to the Pacific region. In total 894,389 visitors and 74,837 cruise passengers were recorded. Samoa is the third most popular destination with a 7.7% share of tourists, and numbers reaching 173,920 visitors and 13,212 cruise passengers (SPTO, 2019). Vanuatu, the seventh most popular tourist destination with a 5.3% share of all tourists, welcomed 120,628 visitors and 135,357 cruise passengers.

Purpose of Pacific region arrivals in 2019:

- 62.3% leisure
- 14.7% visiting friends or relatives
- 13.1% business

Plastic waste generated by the tourism sector is increasing and is overwhelming the already struggling waste management systems in PICs. New forms of plastic waste that cannot be recycled or managed by island communities are swamping systems and leaking into the environment. Land, air and sea-based tourism activities consume a myriad of plastic materials, especially single-use packagings such as PET water bottles, plastic packaging associated with accommodation, toiletry items and catering materials such as polystyrene containers, plastic cutlery and cups.

Total visitor numbers across the Pacific region 2019:

- Land-based tourism: 4,008 tourism accommodations with 41,459 rooms and 74,285 beds recorded
- Airline tourism: 2.26 million passengers, 5.2% above 2018
- Water-based tourism: 728,091 sea arrivals, mainly cruise ships (day visitors)

Fisheries impacts

The marine environment provides integral economic, social and cultural benefits for a majority of PIC inhabitants and is a fundamental source of food security. On average 89% of households in the region consume fish or seafood weekly, equating to 37 kilograms per person per annum. Commercial and subsistence fisheries (mostly domestic) account for 10% of fishing activity in the region (FAO, 2021). Local and foreign offshore fisheries operate 15,000 vessels annually in Pacific waters and are responsible for 90% of fish production in the region. At present, oceans within the PIC boundaries provide 30% of the world's tuna catch (1.5 million tonnes) (Johnson et al., 2018). The Western Pacific has the largest marine diversity in the world with up to 3,000 species found on a single reef (SPREP, 2011). A healthy marine ecosystem is imperative to sustain the fisheries industry, livelihoods and health of PIC communities. Table 1 provides an example of the number of people who are reliant on fisheries sector activities across the Pacific region.

Major plastic waste issues for the tourism sector

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Lack of infrastructure

n existing waste management ystems render them unsuitable to properly manage increased plastic vaste material.

End markets

suffer from a lack of accessibility for ecyclable materials.

Legislation

is difficult to enforce. Table 1: Fisheries activities in the Pacific region (Source: SPC, Coastal Fishery Report Card 2020)

Fisheries in the Pacific islands	Median	Range
Households that participate in fishing	32%	12-80%
Households that sell fish	9%	3–39%
Households that consume fish or seafood weekly	89%	59–98%
Labour force in fisheries	4%	1–21%
Women's participation	8%	0–30%
Fresh fish consumed annually per person	37 kg	16–102 kg

The land area of each PIC is distinctly smaller than the marine environment to be governed as bestowed under the 1982 UN Law of the Sea. Generally, territorial seas extend 12 nautical miles (22 kilometres) from the coastline and the exclusive economic zone (EEZ) is 200 nautical miles (370 kilometres). As of July 2020, 35 PICs share or have overlapping EEZ boundaries with a neighbouring country and act as the national border, a further 13 countries have yet to formalise their bilateral and high seas boundaries. Where borders overlap, neighbouring countries must negotiate a shared boundary (Figure 2) (SPC, 2020).



Figure 2: The status of Pacific Maritime boundaries as of July 2020

Numerous studies investigating the impact of plastics within Pacific island waters definitely indicate that plastics have infiltrated the marine environment and that the impact is devastating. Plastic components from fishing continue to accumulate in the oceans and on coastlines as leaked plastic waste. The material includes gear (nets, lines, ropes and so forth); subsistence packaging and goods used while fishing; leakage from fisheries activities such as lost, discarded or abandoned fishing gear; and practices such as the use of car batteries as weights or anchors or the use of fish aggregating devices (FAD).

Over 30,000 FADs are deployed in the Western and Central Pacific Ocean annually, the largest deployment in any ocean. FADs in the Pacific are less likely to be created from biodegradable materials (Escalle et al., 2019). In addition, microplastics leaked from fishing vessels themselves add to the growing amount of plastics in the ocean. Coastal fisheries activities were incorporated under the larger Pacific fisheries umbrella in 2016 an agreement by Pacific leaders. In 2020, ministers attending the Regional Fisheries Ministers' Meeting endorsed mechanisms to increase stakeholder engagement in regional coastal fisheries management of parties outside of the state. At present, there is no system in place for the systematic collection of fisheries-related waste data.

Fishing activities also increase the waste burden on PICs. Reports from longline and purse seine fleets by shipboard observers state that plastic material was present in 37% of the reported pollution incidents (Richardson et al., 2017). It was estimated that 71% of the purse seine pollution incidents were documented as waste dumped overboard, and only 13% as abandoned, lost or dumped fishing gear (Richardson et al., 2017).

Abandoned lost, discarded fishing gear (ALDFG) is a key component of global marine debris (McFadyen et al., 2009). It includes nets, lines, traps and other recreational or commercial fishing equipment that has been lost, abandoned or discarded in the marine environment (Matthews and Glazer, 2010). The increased use of plastic and nylon fishing gear leads to a decades-long persistence of plastic debris in the marine environment, often capturing, entangling and killing a broad range of marine animals. The amount of ALDFG in marine debris continues to increase each year (McFadyen et al., 2009). According to a review of fisheries observer data (2003–2015) from Western and Central Pacific on-board purse seine and longline vessels, more than 10,000 pollution incidents occurred within the exclusive economic zones (EEZs) of 25 Pacific countries and territories, and in international waters. Of the 'waste dumped' overboard, 60% was found to be plastics. (Richardson et al., 2017)

The plastic components of the fishing gear used in the fishing methods above are mostly derived from non-degradable plastic materials (Table 2). Polyethylene (PE), polyamide (PA), polypropylene (PP) and polyester (PES), and other synthetic materials such as polyvinyl chloride (PVC), polyvinyl alcohol (PVAA) and polyvinyllidene chloride, are the most commonly used plastics material in fishing gear (Hameed and Boopendranath, 2000; Meenakumari and Radhalakshmi, 2003). For example, most nets, ropes and lines are comprised of a wide variety of nonbiodegradable mono- or multifilament fibre polymer materials:

- The main polymers used to make netting include PE, PA and PES.
- Most ropes and lines are comprised of PP, PE, ultra-high molecular weight polyethylene (UHMWPE) and PA.
- Floats and buoys are commonly comprised of PE, acrylonitrile butadiene styrene (ABS), expanded polystyrene (EPS) and polyurethane (PUR).

Table 2: Synthetic fibres suitable for different fishing gear

Material

- Mono- or multifilament polymer nylon
- Polyethylene and polyester (polyethylene terephthalate)
- Polypropylene (PP)
- Polyvinyl chloride (PVC)
- Expanded polystyrene (EPS)
- High-density polyethylene (HDPE)

Fishing Gear

- Nets and mesh for traps, ropes and floats
- Rope and bags
- Rope, bags, tubs, buckets and trays
- Nets, piping, valves, floats, cage and net pen collars and crates
- Floats and buoys
- Flotation ropes, net webbing, storage tanks; pots, tubs and buckets, and piping for water and air supplies

Major plastic waste issues for the fisheries sector

Leakage

of ALDFG is considered a main source of plastic waste in the environment.

Regulations

do not allow for the marking of fishing gear (ID), making it hard to track ALDFG.

Ports

generally have inadequate infrastructure to deal with offloaded waste and recyclables, which is taken to landfills or dumped at sea.

Legislation

is difficult to enforce.

Plastics consumption in the Pacific

Plastic imports and exports

PICs are increasingly moving away from locallysourced products and materials, building a heavy reliance on imported goods including large quantities of plastic materials, which enter the waste stream once consumed. At present, a limited number of PICs collect plastic material for recycling and export, however, the region is known as a net importer of plastic products, rather than a manufacturer/exporter as highlighted in Figure 4.

In 2020, 43,316 tonnes of plastic material were imported into the region, with imports into Fiji accounting for 79% of the total, Vanuatu 11% and Samoa 10% (APWC, 2020).

Fiji was responsible for 100% of all plastic exports, equivalent to 14,670 tonnes. Materials exported include bottles containing products by beverage companies. Samoa and Vanuatu did not export any plastic material during this time. Several companies in the Pacific region export products containing plastic material. Plastic consumption and disposal across the region are creating many challenges: there is an increasing shortage of landfill space and suitable, feasible export markets increase the risk of plastic leakage into the environment. It should be noted that most exports from PICs are to other PICs rather than out of the region. A small percentage of recyclable plastic is exported to Asian markets from countries such as Palau.

Fishing gear plastic imports

In 2019, the countries in focus imported approximately 140.43 tonnes of fishing gear containing plastic components. Fiji was responsible for 46% of all imports. It is important to note, however, that import data is missing from Fiji and Vanuatu for HS code 9507901 (Table 3).

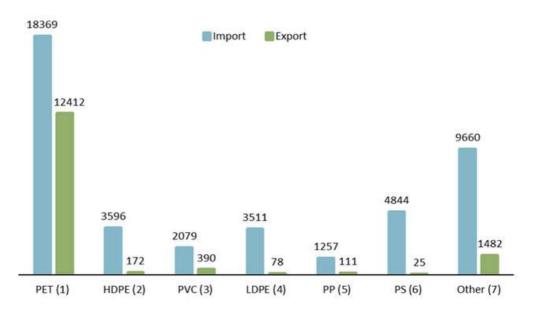


Figure 3: Plastic imports vs exports for 2020 (tonne/year) in the Pacific region (countries studied)

Table 3: Import of fisheries gear in 2019 (tonnes per annum)

HS Code	Definition	Fiji	Vanuatu	Samoa
56081100	Made up of fishing nets: Other	17.50	13.23	0.63
56081900	Other (fish netting)	5.58	2.07	1.65
950710	Fishing rods	1.10	1.02	0.26
950730	Fishing reels	0.45	0.44	0.06
950790	Other+	40.4	14.30*	37.38
9507901	Line fishing tackle, including fish landing nets	-	-	4.34
	Total imports	65.03	31.07	44.33

+ Other fishing rods, fish hooks, line fishing tackle, fish landing nets, butterfly nets, and net decoy 'birds' and similar hunting devices * 2018 data provided

Institutional Framework

Pacific leaders across the region have been highly influential in advocating for the preservation of the natural environment. However, fragmented governance strategies and approaches do not adequately address emerging and urgent pollution concerns such as plastic litter and microplastics in the region.

Ultimately, a multilateral plastic pollution convention is needed to cap global virgin plastic production, establish global standards for the design of safe plastics, and provide scientific, financial, and technical assistance to develop tailored national plastic pollution prevention action plans and policy tools. (Farrelly et al., 2020)

Multilateral environmental agreements (MEAs) and regional agreements in the Pacific

A commitment to the number and type of multilateral environmental agreements (MEAs) varies between countries across the region. Despite a regional push to prioritise and address the issues connected to MEAs, several factors such as lack of resources and technical skills have led to less than one-third of all required reports having been submitted since 2015 (UN ESCAP, 2019). Recently the lack of data has impacted visibility, resulting in nine PICs being excluded from the 2020 SDG Index. Samoa, for example, was missing 21% of its values (UN ESCAP, 2019). Table 11 (Appendix 5) highlights MEAs and regional agreements that make explicit mention of plastic waste, the PICs that have agreed to participate, and reporting compliance.

Implementing obligations set out under MEAs is rarely reflected in country-level documents and despite the requirement to incorporate them into national legislation where they are not specifically addressed, there is no national legal obligation to comply with the requirements. Farrelly et al. (2020) suggest that when international conventions are adopted into national law in the Pacific, the focus on downstream processes takes priority over the upstream controlled flow of materials into the PIC where end-of-life management solutions are actually needed. Table 13 (Appendix 6) outlines which PIC governments have incorporated plastic waste management within their current environmental legislation.

Amendments to the Basel Convention from 1 January 2021 restrict international trade of plastic scrap material and waste to reduce leakage into the environment.

International shipments will require prior written consent of importing and any transit countries. Plastic scrap materials must be pre-sorted, clean, uncontaminated waste. Plastics consisting of one non-halogenated polymer such as polyethylene, polypropylene and polyethylene terephthalate (PET) will not be subject to the 'prior informed consent' procedure if destined for environmentally sound recycling.

Regional agreements

Pacific leaders have introduced several policies, legislation and frameworks to restrict the import, production and leakage of waste, especially plastic material. These include:

- Cleaner Pacific 2025: Pacific Regional Waste and Pollution Management Strategy 2016– 2025, a comprehensive long-term strategy for integrated sustainable waste management and pollution prevention and control, establishing national and regional waste recommendations in the region.
- Environmental Impact Assessment Guidelines for Coastal Tourism Development in Pacific Island Countries and Territories (SPREP).
- The Small Island Developing States (SIDS) Accelerated Modalities of Action (SAMOA) Pathway recognises that sustainable tourism represents an important driver of sustainable economic growth for SIDS.
- SPREP (2018). Pacific Regional Action Plan: Marine Litter 2018–2025.
- SPREP (2016). Pacific Regional Waste and Pollution Management Strategy 2016–2025.
- SPTO (2021) Pacific 2030. Sustainable Tourism Policy Framework.

Fisheries agreements

The Western and Central Pacific Fisheries Commission (WCPFC) is comprised of 25 members, the fishing entity of Chinese-Taipei and seven territories for vessels that are licensed to fish within their EEZs under fisheries access arrangements. All Members of WCPFC are obliged to comply with the decisions of the Commission as they are recorded in conservation and management measures (CMMs). The Commission adopted a CMM on Marine Pollution in 2017 (CMM 2017–04). This decision extends the prohibition on the discarding of plastic waste to fishing vessels registered in countries that are not a party to MARPOL Annex V but operate in the WCPFC Convention Area. It is uncertain how the WCPFC will define and enforce the respective rights and duties regarding waste management of both the flag state and the port state provided for in the Measure (Bulman 2018).

Two additional decisions of the Commission relate to processes and systems for the collection of independent data from fishing operations through the deployment of at-sea human observers under the Commission's Regional Observer Programme (ROP).

Under MARPOL, the Conservation and Management Measure on Marine Pollution (effective 1 January 2019) specifically addresses the impacts of abandoned, lost or otherwise discarded fishing gear (ALDFG) on marine species and ecosystems.

The measure encourages PICs that have not already ratified MARPOL Annex V and The London Convention (IMO, 2019). By ratification PICS would have mechanisms and support to prohibit their fishing vessels from discharging any plastics; to undertake research on marine pollution related to fisheries; to encourage all vessels to retrieve fishing gears; to ensure port reception facilities are adequate to receive waste from fishing vessels.

Fisheries strategies in the Pacific

- 12 PICS have current national coastal fisheries roadmaps or strategies in place.
- 7 PICS have enacted new coastal fisheries management legislation since 2015.
- 9 PICs have current coastal fisheries management policies. Ten have policies in need of drafting or revision.
- 14 PICs have evidence of monitoring, control, surveillance and enforcement of coastal fisheries management measures. (Source: SPC, 2020)

Plastic bans in the Pacific

A growing number of countries within the Pacific are beginning to adopt measures to abate the plastics crisis. Regulations on imports, bans on single-use plastic items and adaptive legislation such as container deposit schemes are being implemented to mitigate plastic consumption and disposal across the region.

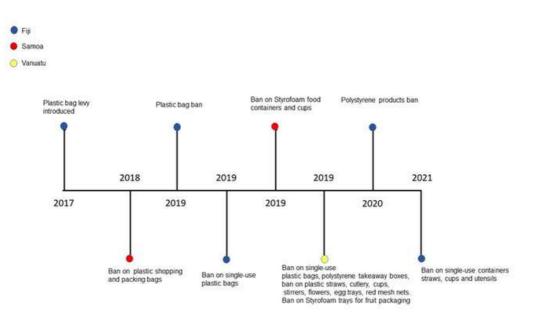


Figure 4: Plastic bans across the Pacific region (Fiji, Samoa and Vanuatu)

However, PICs are responsible for addressing plastic leakage received from other regions via ocean currents and fishing activities. A recent study found that while preventative measures are implemented in some countries, there are a number of additional opportunities for governments to close gaps and strengthen plastic pollution policy frameworks (Farrelly, 2020).

Figure 4 provides a timeline of plastic bans in the countries of interest for the purpose of this study. Each country has commenced plastic bans in varying degrees. **Plastic bans in the Pacific**

- 14 countries have established plastic bans
- 12 countries have banned single-use shopping bags
- 3 countries have implemented levies on single-use plastic items

Waste management government bodies, budgets and levies

In the Pacific region, waste management policy falls under the national government, and waste collection is under local, municipal government, and traditional leaders. Large infrastructure and equipment programmes are often funded by international donors.

Table 4: Waste management budgets and levies

Country	Governing body	Landfill fees/levies
Fiji	NSWMA	 Waste collection and disposal at approximately FJD 1.7 (Fijian Dollar) per household each week Tipping fee (at one disposal site), garbage fee, town rate, licences (recycling, waste picking), littering fines and notices, and sales of compost and recyclables Landfill disposal charges, based on weight, levied to all users (i.e. commercial and industrial) at approximately USD 14 per tonne for general and green wastes, and USD 25 per tonne for special (regulated) waste
Samoa	MNRE	Tipping fee at Tafaigata waste disposal site
Vanuatu	DEPC	Waste collection fees, annual property taxes, tipping fees, composting services and fines from illegal burning

In the period 2010–2018, 35,636 mapping projects were funded and donors contributed USD 20.44 billion (Lowy Institute, 2020). Since 2009, 60 foundation grants have been distributed to a total value of USD 9.5 million by USAID. The waste management budget and policies are provided in Table 4.

Fiji

The Department of Environment has an annual waste management budget that includes solid waste, e-waste and hazardous waste, of USD 230,000 (PRIF, 2018). The Ministry of Health also has a waste and pollution management budget of USD 50,000 annually.

Samoa

The solid waste budget of the Ministry of Natural Resources and Environment (MNRE) for 2017 was WST 3,262,997 million (Samoan tala) for all collection and disposal services, landfill operations, maintenance work and public cleaning. The cost of waste management in Samoa represented 12% of MNRE's annual budget and 0.47% of the government's national budget in 2019.

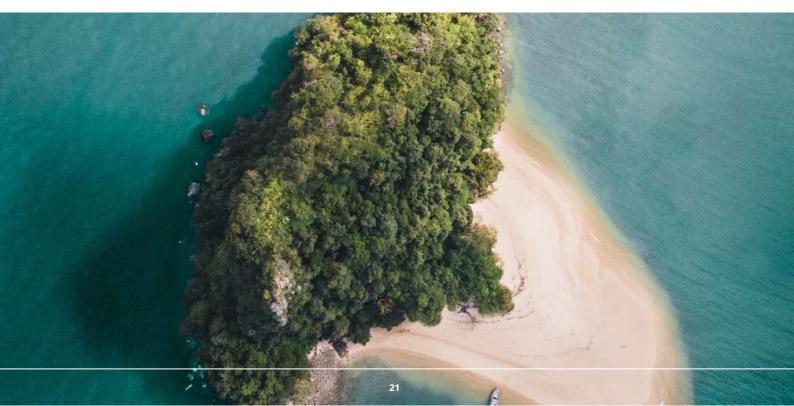
Vanuatu

Waste management operations are funded through several channels, such as user-pays, system fees obtained from waste collection services, property tax or tipping fees. In Port Vila (PVM), waste collection is funded from several sources: half-yearly waste collection fees, annual property taxes (5.5% of property value), tipping fees at Bouffa landfill and fines from illegal burning. The total expenditure for waste services in PVM in 2017 was 23,714318 Vanuatu vatu (VUV) and the total income was VUV 31,330,874 (Appendix B: National solid waste agency—waste budget) giving a net profit of VUV 7,616,556 (Waste Wise Consulting, 2018).

Tourism budget

The lack of international tourism during the last 12 months has led to a loss of profits against previously profitable foreign exchange and taxation revenue in the Pacific region, especially in those countries where a consumption tax is levied on tourism and related services (SPC, 2021).

For example, in 2019 tourism activities in the Cook Islands accounted for 66.1% of the national GDP. At present Fiji is the only country that requires tourists to pay a tax associated with travel that, in principle, can be earmarked for environmental purposes to contribute to financing environmental programmes.



Plastic Waste National Level Quantification and Sectoral Material Flow Analysis - Pacific

Waste service provision and infrastructure

Collection services and waste management responsibilities

A majority of PICs provide waste collection services in capital cities and major urban centres only. Peri-urban, regional, and rural communities and outer islands remain largely un-serviced. Where no collection services exist, the rate of unmanaged waste falls between 27% and 60% (APWC, 2019; APWC, 2020). More detail is provided in Table 5.

Municipal authorities have extremely low or limited capacity to undertake community education and compliance activities. Often, where community education can take place, there are no appropriately managed dumpsites for residents to dispose of their waste safely. Common themes across the countries of interest in the region include:

- At present, households, commercial businesses, tourism operators and fishers are not required to segregate waste.
- Some PICs have implemented a prepaid bag system for waste disposal – a government-issued bag that can be used to dispose of household waste. The fee paid for the bag provides funding for the provision of waste collection services. These seem to be more effective than traditional collection systems.

- Many rural areas have limited to no waste services available; this creates considerable potential for plastic leakage.
- Commercial businesses and tourism operators are generally responsible for organising their own waste collection.
- 50% of waste in Vanuatu and 58% of waste in Samoa is unmanaged.

Collection rates in capital cities in Vanuatu, Solomon Islands and Samoa reach 90%, however they fall to between 0 and 20% in rural areas and outer islands in the same countries (APWC, 2019 and APWC, 2020). Palau services nearly 90% and Tuvalu 100% of the population (APWC, 2019).

Table 5: Solid waste collection in Fiji, Samoa and Vanuatu

	Fiji	Samoa	Vanuatu
% of country provided with a waste service	100% of urban areas	35–60%	35–60%
Waste collection frequency	Collection varies between locations. Twice a week or 3 times is common	Twice a week, Monday to Friday	Twice a week
Collection	Collection of household waste by councils. Commercial waste arranged separately by businesses.	Collection from households only. Commercial waste is the responsibility of businesses and agencies.	Prepaid bag used for household collection
Source separation	1 of 7 councils source separate Cardboard, aluminium, pet, glass, metals, office papers.	No	No
Disposal site	One sanitary engineered waste landfill at Naboro which serves the Suva city and the surrounding areas; Labasa semi-aerobic waste landfill and Lautoka waste landfill 3 large composting facilities Lack of a designated disposal site in some rural areas.	Two semi-aerobic waste landfills on Upolu & Savai'i Islands Dumpsites	One semi-aerobic waste landfill in Efate (Bouffa Waste Landfill) & controlled disposal site in Santo. Open dumpsites
Weighbridge	1 located at Vunato disposal site 1 located at Naboro landfill in Suva	Yes, at Tafaigata Landfill	No
Plastic recycling	l active private company	No	No
Fee charged for collection	Yes, for all councils. For outside and rural areas, free collection is provided	No	As part of pre-paid bag

Landfill

Landfills in Fiji, Samoa and Vanuatu are islands and have approximately 10 to 15 years of landfill space available. Tafaigata landfill in Samoa and Naboro landfill in Fiji each include a weighbridge for recording the amount of waste entering the landfill. Lack of access to electricity and other amenities is a significant challenge in the installation of infrastructure, including weighbridges, in landfills across PICs. Tipping fees are commonly charged for commercial premises, however, dumpsites that are not secure receive waste after hours. No tipping fee is charged at landfills in Vanuatu and Solomon Islands.

Landfill assessments

The European Union (EU)-funded PacWaste Plus programme, managed by SPREP, has commissioned detailed landfill assessments in both Solomon Islands and Vanuatu, plus comprehensive waste audits in Federated States of Micronesia, Papua New Guinea, Nauru, Niue, Republic of Marshall Islands and Timor Leste, to add to those recently completed in Tuvalu and Cook Islands (PRIF), Palau (UNEP), Samoa (IUCN and World Bank), and those – Tonga, Kiribati (World Bank), Fiji (PRIF, IUCN) – which are due for completion in Q2 2021.

Fiji

- Naboro Sanitary Landfill is the only sanitary landfill in Fiji accepting residential, commercial, quarantine and disaster waste. There is a tipping fee attached to the disposal.
- There are three additional controlled disposal sites with restricted access and five (5) authorised open disposal sites.
- Waste pickers operate on a number of disposal sites.
- In rural settlements, backyard burial and open burning are still common practices, particularly when the residents are unable or unwilling to transport their waste to the nearest council waste disposal site (DoE, 2019).

Samoa

- The Tafaigata Waste Disposal Site was upgraded from an open dumpsite to a semiaerobic waste landfill in 2003 under technical assistance provided by the Japan International Cooperation Agency (JICA). The World Bank in partnership with JICA also supported the construction and installation of a healthcare waste incineration facility in 2005. In addition, the European Union (EU) funded the construction of special open lagoons as disposal facilities for sewage and sludge. An area has also been set aside for the burial of asbestos and the storage of disaster waste during disaster events.
- Waste pickers operate on-site collecting scrap metals and bulky waste.
- A further semi-aerobic waste landfill structure for solid waste is located at Vaiaata on Savai'i Island. It has no recycling component, but there is an area to stockpile reusable and recyclable waste. Currently, there is no environmental monitoring information and data available from either site.

Vanuatu

- There are three waste disposal sites in Vanuatu: Bouffa landfill (Port Vila City Council), Luganville dumpsite (Luganville Municipal Council) and Lenakel dumpsite (Lenakel Town Municipal Council).
- Improvement is proposed for the Bouffa landfill and the proposals for Luganville and Lenakel disposal sites are currently underway.
- Over the past two decades, several donorfunded projects have been carried out at the Bouffa landfill to improve the current infrastructure. Plans to install a weighbridge have been postponed due to an insufficient electricity supply at the site.
- Luganville dumpsite has been operational since the end of World War II. In 2017, the dumpsite was extended, and the site is now approximately 4.2 hectares, with the capacity to last an additional 20 years.
- Lenakel dumpsite (Tafea Province) is currently used for waste disposal, but not yet legally endorsed by the Department of Environmental Protection and Conservation. There are no facilities available on site and many improvements are needed in the future to upgrade the area.

Regional waste initiatives

"In March of 2018, The China Navigation Company (CNCo) and the Secretariat of the Pacific Regional Environment (SPREP) signed onto the Moana Taka Partnership to address critical waste management issues in the Pacific Islands. This partnership enabled CNCo to utilise empty shipping containers on its vessels to transport recyclable waste from eligible Pacific Island ports, pro bono, to be transported to ports in Asia Pacific with eligible recycling facilities" (Sustainable Islands Platform, 2019).

Waste generation and disposal

Waste disposal in Pacific islands and territories is calculated at 1.3 kilograms per person per day (SPREP, 2016). Audits across the Pacific region note that on average 70% of waste disposed of is compostable material.

The Cleaner Pacific 2025 strategy target for per capita generation of municipal solid waste is 1.3 kilograms or less per person per day. Studies indicate that the waste generated by the household and commercial, tourism and fisheries sectors across the three Pacific countries included in this study falls significantly below the Cleaner Pacific 2025 targets. Additionally, figures fall below the global average (0.74 kilograms per person per day). In total, all three countries generate on average 0.6 kilograms of waste per person per day, of which 0.06 kilogram per person per day is plastic. Of note is that countries with higher GDPs have a higher share of construction/industrial waste. GDP across most Pacific countries per capita is much lower than the global average, and therefore it is expected that waste disposal will be below the global average.

Comparison of total waste disposal between the Pacific and Caribbean regions

Figure 6 outlines the total waste disposal per capita versus GDP per capita (based on GDP per capita USD, 2019). It clearly illustrates that countries in the Caribbean dispose of greater amounts of waste per person per day. At the country level, there appears to be a correlation between the classification of the country's economy and the amount of waste disposal. The World Bank (World Bank, 2021) classifies the following.

- Lower-middle-income economies Vanuatu
- Upper-middle-income economies Fij Grenada, Samoa, Saint Lucia, Tuvalu
- High-income economies Antigua and Barbuda, Palau

From Figure 6 it is evident that countries with higher GDP per capita dispose of greater amounts of waste per day.

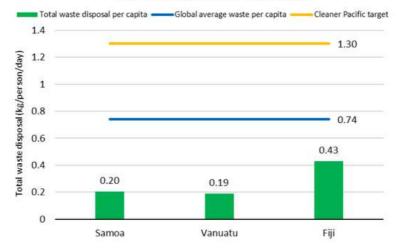
Waste disposal in the Pacific region across sectors

Waste disposal in the Pacific region across sectors:

- Household 0.14 kilogram per person per day
- Commercial 0.23 kilogram per person per day
- Tourism 1.51 kilograms per tourist per day
- Fisheries 0.93 kilogram per vessel per day

¹ World Bank (2021) Data: World Bank Country and Lending Groups. Country Classification. Available at:

https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups



Waste disposal per capita - Pacific region

Figure 5: Waste disposal in the Pacific region

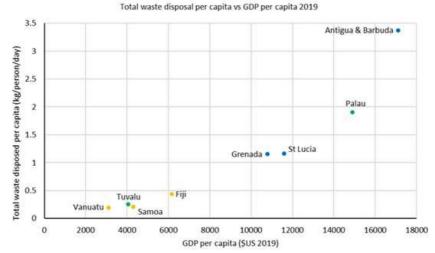


Figure 6: Total waste disposal comparison between the Caribbean and Pacific regions (Source: APWC data, 2019– 2020)

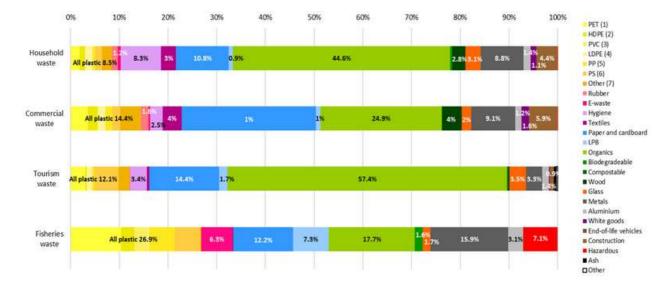


Figure 7: Composition of waste disposed of in the Pacific region (Fiji, Samoa and Vanuatu) (tonnes per year)



Plastic waste disposal practices across sectors in the Pacific region



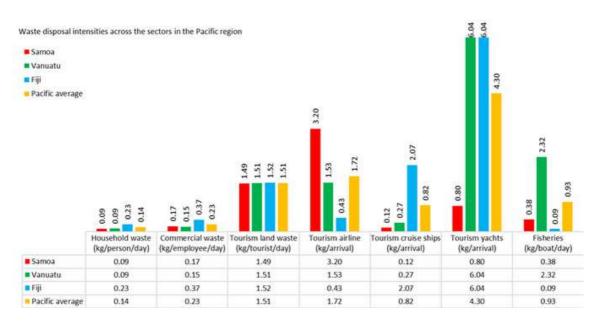


Figure 9: Waste disposal intensity across sectors in the Pacific region

Figure 7 provides a visual overview of the composition of waste disposed of by the household and commercial, tourism and fisheries sectors in the countries of interest during 2020. Organic material accounted for 39% of all waste disposal across the three countries. Plastic material accounted for 11% overall.

Waste disposal methods in the Pacific region

According to APWC audits in 2020, the most common waste disposal method across all sectors in the countries of interest for this project is the use of the collection services provided by the government (Figure 8). For a detailed display of waste disposal methods, please see individual country reports. For a detailed display of waste disposal methods, please see individual country reports.

Waste disposal across sectors

Figure 9 illustrates the total waste disposal intensity versus the plastic disposal intensity for each sector in the countries of interest for this study. It clearly shows that the tourism sector disposes of the largest amount of waste per person per day (1.51 kilograms per tourist per day) followed by the fisheries sector (0.93 kilograms per vessel per day).

Quantifying plastic leakage

APWC's approach to quantifying plastic leakage included capturing data on everyday consumption and generation of plastic products used on household and commercial premises, and waste audits carried out by the waste management sector. Furthermore, to get a clearer picture on plastic use and disposal pathways, audits were undertaken on stockpiles and landfills to capture data on materials that are not usually disposed of in household bins (for example, bulky commercial and construction waste).

Overall plastic waste disposal and leakage

The 2020 waste audits estimate that 19,281 tonnes of plastic waste were disposed of and another 9,614 tonnes were leaked into the environment or were stockpiled during 2020 in Fiji, Samoa and Vanuatu. It was found that Fiji disposes of the greatest quantities of plastic waste annually and Vanuatu the lowest (Figure 10). Fiji also leaks the most plastic waste, while Samoa has the least. However, with respect to the ratio of plastic waste disposal to leakage, Fiji leaks three times less than it disposes of, while interestingly, Vanuatu's plastic leakage exceeds plastic disposal rates. Note that the leakage in Fig 10 includes the fishing gear leakage that was separated in the individual reports

	Population (#)	Territory area (km2)
Samoa	87,289	2,831
Vanuatu	131,943	12,189
Fiji	357,050	18,333

Plastic waste disposal and leakage per sector and polymer type

Of the four sectors examined, the greatest quantities of plastic waste are disposed of by the commercial sector, but most plastic waste leaks from households (Table 6). A graphical representation of these results can be found in Figure 11 below. The overall breakdown of disposal and leakage per country and per sector is provided in Table 7.

- In 2020, commercial premises accounted for 45% of plastic waste disposed of, while households accounted for 45% of plastic waste.
- Fiji accounted for 45% of all household leakage and 59% of commercial business plastic leakage from the three countries.
- Fiji contributed 50% (733.3 tonne/year) of the total tourism sector plastic leakage (1,481.6 tonne/year).
- Vanuatu was responsible for 81.6% of all plastic leakage by the fisheries sector (118.4 tonnes/year). Auditors noted waste from fishing vessels in Vanuatu was not appropriately contained.
- Of the overall plastic leakage in the Pacific region, Samoa contributed the least (1863 tonnes/year or 19.4%.)

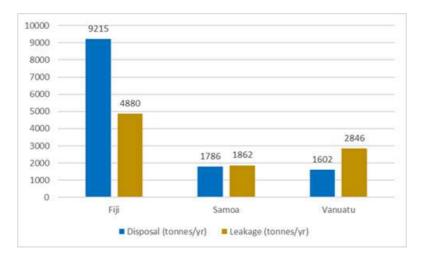


Figure 10: Plastic waste disposal and leakage in the Pacific

Table 6: Overall plastics leakage rate per sector (tonne/year)

	Household waste		Commercial waste		Tourism waste		Fisheries waste	
	Disposal	Leakage	Disposal	Leakage	Disposal	Leakage	Disposal	Leakage
РЕТ (1)	1707.5	625.3	2153.1	627.5	658.2	218.0	29.7	24.9
HDPE (2)	986.3	517.1	1200.3	579.0	61.5	63.5	7.7	17.0
PVC (3)	61.9	251.2	94.3	164.5	0.5	4.9	7.9	10.3
LDPE (4)	1353.4	513.6	894.6	388.4	228.3	73.8	0.6	0.2
PP (5)	562.5	333.3	837.8	291.0	117.6	84.9	15.1	24.8
PS (6)	1265.0	584.7	999.4	455.2	1071.0	424.1	14.7	17.4
Other (7)	1892.1	1469.1	2574.7	1214.4	484.1	612.3	0.8	23.8
Total	7828.6	4294.3	8754.2	3720.1	2621.2	1481.6	76.5	118.4

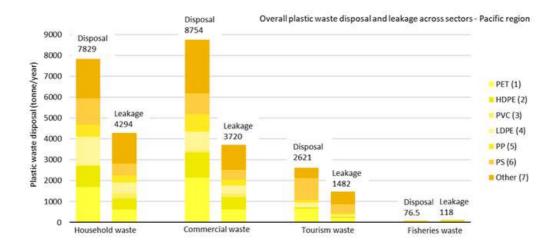


Figure 11: Plastic waste disposal and leakage rates in the four sectors of interest in Fiji, Samoa and Vanuatu (tonnes per year)

Table 7: Plastic waste disposal and leakage across countries and sectors (tonne/year)

		Household	Commercial	Tourism	Fisheries
Samoa	Disposal	954.51	1157.29	257.70	1.09
	Leakage	1014.23	614.06	233.73	0.92
Vanuatu	Disposal	997.71	716.26	246.41	66.09
	Leakage	1341.39	900.83	514.61	96.66
Fiji	Disposal	5876.40	6880.70	2117.08	9.31
	Leakage	1938.70	2205.19	733.26	20.86

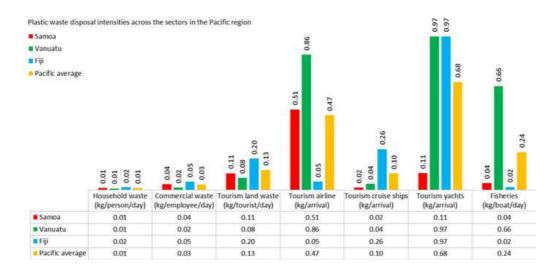


Figure 12: Plastic waste disposal intensity across sectors in the Pacific region

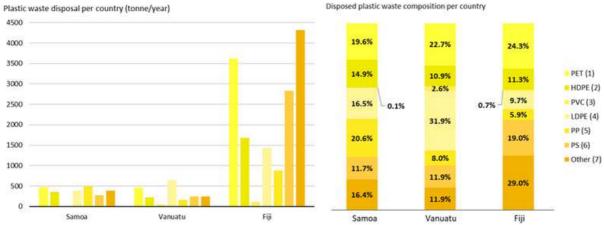


Figure 13: Plastic waste disposal and polymer composition in the Pacific region

With respect to disposal intensities, results expressed as the amount of waste disposed of per person per day show that the tourism sector generally contributes to more plastic waste disposal per person on a daily basis than households and commercial premises (Figure 12). The fisheries sector disposes of 0.24 kilogram of plastic waste per boat per day, but this would be quite variable depending on the number of fishermen on board.

The most common plastic polymer disposed of by Samoa and Fiji is PET, with a 19.6% and 24.3% contribution respectively (Figure 13). Almost one-third (31.9%) of Vanuatu's plastic waste was composed of LDPE polymer. In all three countries, PS comprises more than 10% of plastic waste by weight, mainly in the form of Styrofoam food containers. Although a lightweight material, foamed PS is a problematic material for landfills and dumpsites as it consumes a large volume of air space, which is lacking in the region.

Top 10 plastic items disposed of

Table 8 provides a list of the top 10 plastic items most frequently disposed of in the Pacific region.

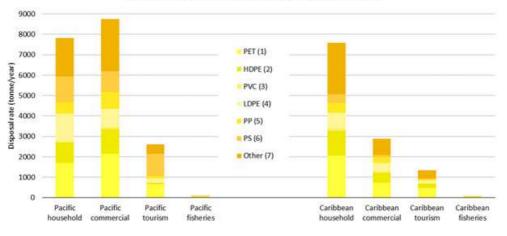
• The top 10 plastic items account for 62.7% (11,797.8 tonnes) of all plastic waste disposal during 2020.

- PET water bottles are the most common plastic item disposed of in the Pacific (15.1%), followed by soft plastic packaging (11.2%) and Styrofoam takeaway food containers (10.7%).
- Hygiene waste (nappies and sanitary items) are not included within the scope of this project, however, these two materials accounted for 33.2% (9,568 tonnes) of all plastic waste disposed of in 2020. Nappy disposal alone accounted for 30.6% of plastic waste disposed of in the Pacific region – the largest disposal of any plastic category by weight.

Figure 14 compares plastic leakage per polymer by region and sector. It indicates that the household and the commercial sector contributes the largest amount to plastic leakage in both regions, followed by tourism and fisheries. It also shows that data received during the audit process indicates that the Pacific region was responsible for a greater amount of plastic leakage in 2020 than the Caribbean region. It should be noted that a part of the sample collection for the tourism sector was not possible due to the COVID-19 pandemic; therefore, data were extrapolated from alternative methods as defined in each individual country report.

Table 8: Top 10 plastic items disposed of by household and commercial, tourism and fisheries sectors in Fiji, Samoa and Vanuatu

Polymer	Top 10 plastic	Disposal rate (tonne/year)	%
PET 1	Water bottle SUP	2849.]	15.1%
OTHER 7	Soft plastic packaging SUP	2108.3	11.2%
PS 6	Styrofoam takeaway food container SUP	2013.1	10.7%
LDPE 4	Soft plastic packaging SUP	1581.7	8.4%
HDPE 2	Garbage bag SUP	987.6	5.2%
PS 6	Food container SUP	568.0	3.0%
PP 5	Various plastics (other)	505.0	2.7%
PET 1	Cleaning agent container	486.1	2.6%
PP 5	Food container/tray SUP	407.3	2.2%
PET 1	Cooking oil container SUP	291.7	1.5%
Total		11,797.8	62.7%



Plastic waste disposal - Pacific vs. Caribbean region (tonne/year)

Figure 14: Regional comparison of plastic waste disposal – Pacific and Caribbean regions

Plastic recovery options

Approximately 2,200 tonnes of PET and HDPE plastic could be recycled annually with a container deposit levy (CDL) in place (based on an average reduction rate of 80% in mismanaged waste under CDL) as shown in Figure 15. A successful CDL has the potential to be financially sustainable, providing income that can be earmarked for solid waste programmes such as landfill and dumpsite remediation, improvement of collection and sorting processes, education programmes and environmental clean-ups. At present, several PICs are investigating the viability of establishing a regional recycling hub (Scoping Study for the Regional Recycling Network for the Western and Eastern Pacific Region) whereby recyclable material from several PICs can be collated. This would help solve a major challenge of moving materials to external markets – due to low trade volumes and low international market values - by increasing economies of scale and bargaining power.

Extending a CDL to capture 80% of waste materials as outlined in Figure 15 could divert 2,186 tonnes of recyclable waste from landfill or unmanaged disposal annually. The model forecasts a significant impact through the capture of 80% of organic (green and food) waste materials, in particular in Fiji (56,102 tonnes). Further diversion could be achieved by extending a CDL to an advance recovery fund (ARF) – as seen in Tuvalu, which captures additional materials such as plastic and glass bottles – to include other recyclables such as ewaste and white goods. Bans or incentivising alternatives to single-use nappies could divert another problematic plastic waste from landfill.

If a CDL covering PET beverage bottles is introduced, and 80% of bottles otherwise destined to be leaked are captured by the scheme, then PET leakage could be reduced by 1,033 tonnes per year, a reduction of 69%. A CDL covering all PET bottles, including personal care, laundry, home cleaning and cooking products, could reduce PET leakage by 1,132 tonnes per year, a reduction of 76% (Figure 16). A CDL scheme in Palau recovered 70–90% of covered bottles according to prior work by APWC and the Palau Solid Waste Management Office of the Bureau of Public Works estimates. CDL schemes across the Pacific could incentivise reverse logistics across the region and create recycling markets for countries that would otherwise not have sustainable and viable access

² APWC (2019), Waste Characterisation and material flow in Palau, UNEP

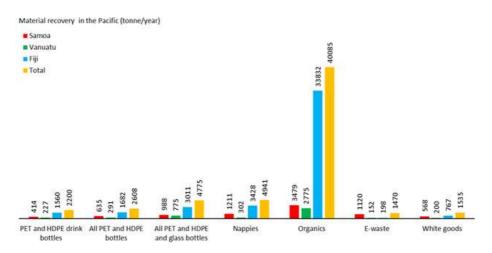


Figure 15: Potential materials available for capture under CDL legislation in Fiji, Samoa and Vanuatu (T/y)

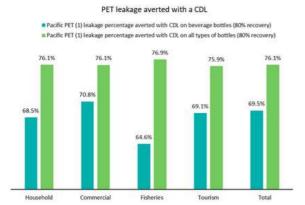


Figure 16: Potential PET leakage averted with a CDL in the Pacific region

A CDL scheme covering HDPE beverage bottles that obtains an 80% compliance rate within Fiji, Samoa and Vanuatu could potentially capture and prevent the leakage of 1% (14 tonnes per year) of HDPE beverage bottles. If the CDL were extended to cover HDPE containers for personal care, laundry and home cleaning, 8% (95 tonnes per year) of all HDPE could be diverted from leakage (Figure 17). LDPE leakage averted with a CDL

Pacific HDPE (2) leakage averted percentage with CDL on beverage bottles (80% recovery)
 Pacific HDPE (2) leakage averted percentage with CDL on all types of bottles (80% recovery)

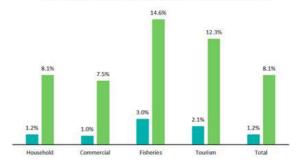


Figure 17: Potential HDPE leakage averted with a CDL in the Pacific region

2

Key gaps and recommendations for the Pacific region

- All countries must promote and support the international waste management hierarchy to guide waste management decisions as follows:
 - Waste avoidance
 - Waste reduction
 - Waste reuse
 - Waste recycling
 - Energy recovery
 - Final disposal
- Support from development partners and regional and international projects must consider providing continued assistance to countries to create an improved and sustainable household waste collection and disposal services, including an increase in the coverage (number of households) in the region receiving basic waste management services. This is paramount if the overall vision of a Cleaner Pacific is to be achieved by 2025.
- Support must be provided to PICs in the development of applicable economic instruments to support sustainable waste management. Instruments must be fit for purpose and country-specific.
- To ensure the availability of key waste management information in the future, it is strongly recommended that countries consider incorporating some waste management questions under the national census in order to gather key baseline information. This can provide useful information for waste management services planning.

- Countries must be supported through current and future regional and international waste management investments to promote Integrated Waste Management Planning. The plan should include setting targets for achieving waste reduction and recycling and form part of the business licensing for medium to large businesses.
- Governments must provide tax incentives for businesses with less waste generated from their operations. For example, the installation of coolers with treatment systems that connect to water supplies without the use of plastic bottles.
- It is recommended that the Moana Taka Partnership consider an extension to other materials with some room for the low volume materials and materials with market value to utilise this important initiative.
- Consider implementing a 10-digit globally, harmonised system (GHS) for customs tariff codes to improve tracking and compliance of import and export materials, in particular plastic materials. Provide training to countrybased staff to ensure consistency in the input of data.
- Implement a large-scale data management project to measure plastic waste and spending on waste and marine pollution management, including landfill management, cost of clean-ups and habitat rehabilitation, and cost savings due to waste diversion from landfills. This will help inform the governments and aid organisations on how best to spend their funds. Data management must remain the responsibility of the PICs. Implement a region-wide training programme to collect consistent data across sectors.

- Streamline monitoring systems and implement a centralised data-sharing platform to be available for all levels of government in PICs to share waste data, policy information, circular economy initiatives, monitoring and evaluation, and indicators for environmental performance. Data can be used across multiple reports reducing reporting burden.
- Divert organics away from landfill disposal and towards composting options across all sectors to help improve landfill management. This will create more capacity for non-recyclable material including plastics and less leakage from the landfill itself. Organics infrastructure is also important because of the push across the globe to introduce biodegradable/compostable alternatives to single-use plastics.
- Develop educational material to inform residents, fisher folk and tourists about where to dispose of recyclables to avoid contamination and raise awareness of plastic pollution and plastic leakage issues. Promote 'zero waste' and 'sustainable consumption' concepts across all sectors, encouraging innovations and production of alternatives to single-use plastics and plastic packaging across all sectors.
- Implement options for plastic return such as container deposit legislation or an extended producer levy system across all sectors for capturing other recyclable materials such as PET, HDPE, glass, metal containers, scrap metals, nappies, e-waste and white goods. Barriers that have prevented draft regulations from being finalised should be identified and a roadmap designed to assist the delivery of regulations that address a deposit and refund scheme and product stewardship.

- Waste management plans should be integral components of licensing requirements for manufacturers, supermarkets, large shops, large restaurants, tourism developments, airports and ports. Mandated reporting of data upon request by government/authorities will facilitate better monitoring and future improvements. Tax incentives and national awards give positive reinforcement, encouragement and acknowledgement to businesses when they meet their waste-reduction targets, thereby promoting best practices and sustainability across all sectors.
- Include waste management and source separation as a licensing requirement in all sectors, ensuring segregated material is presented correctly for export or in-country processing, if available. As part of the waste management plan for tourism developments, data should be recorded on waste generation, collection and disposal, including segregated recyclables. Regular site visits and monitoring will help track progress toward plastic waste reduction across all sectors.
- Introduce levies or tax incentives to discourage hotels and resorts from providing guests with plastic PET bottles (250–500 ml). Encourage refillable water bottles for local use by establishing water refilling services and portable water treatment systems.
- Port authorities should provide facilities for fisher folk to repair and store nets to discourage overboard dumping. Developing fishing gear recapture schemes will encourage the retention and surrender of damaged gear for recovery or proper disposal.

- Promote the reporting of abandoned fishing gear in accordance with IMO's mandatory reporting requirements under MARPOL Annex V, including discharge or accidental loss of fishing gear.
- Introduce fisheries observers to monitor plastics taken from and returning to port. Adherence to compulsory monitoring and recording of waste generated could become a requirement for fishing licences. CCTV cameras or regular site visits may assist with waste monitoring.
- Laminated posters/signage in local languages and English should be made available to fishing vessels, outlining for the fishing crew the appropriate waste management practices.
- •
- Support the feasibility of a Pacific regional hub for receiving recyclable material from all countries in the region. Ensure each country is ready with financial mechanisms when the concept comes to fruition.

Learning opportunities for each region

A number of opportunities exist for both the Caribbean and Pacific regions to adopt and advance mechanisms for controlling plastic material flow, particularly in capturing mismanaged plastic waste. Some examples of this include:

 Governance – The Caribbean countries that were studied as part of PWFI have initiated reforms in waste management governance and established Solid Waste Management Authorities with the function of managing ALL waste management operations, monitoring and compliance. The legislative functions still sit within the ministries of the environment. The PWFI project could potentially organise a round table for the two regions to share their journeys towards a circular economy through improved governance and consequently data management.

- Tourism sector Rodney Bay Marina in Saint Lucia is an example of a segregated collection system. Similar collection systems could be established at all ports where cruise and yachting tourists are welcomed.
- The Caribbean region could consider adopting a fisheries observer programme similar to the Pacific model, which includes monitoring of waste dumped overboard.
- The Pacific region is currently exploring the concept of a regional recycling hub to improve the marketability of recyclable plastic material. This concept may also be transferable to the Caribbean region.
- Palau (in the Pacific region) has introduced the Palau Pledge. Visitors sign a pledge upon entry to the country recognising a commitment to respect and protect the natural environment. An educational video explains the importance of the pledge and its value. Other Pacific and Caribbean islands could introduce a similar pledge to highlight the importance of the natural environment and encourage visitors to commit to a range of environmental responsibilities.

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Appendix 1: Plastic comparison between regions

Top 10 plastics

Table 9 outlines the top 10 plastic items disposed of in the Caribbean and Pacific regions using data from our countries of interest (2020).

In the Caribbean

- The top 10 plastic items account for 60.8% of all plastic waste disposed of during 2020 (7,877 tonnes)
- Single-use plastic (SUP) accounts for 50% of the top 10 plastics by polymer type. These items account for 26.2% of plastic waste disposal (3,393 tonnes).
- PET containers account for 30% of the top 10 plastics by polymer type. These items account for 18.4% of all plastic waste disposal. (2,377.13 tonnes).
- Plastic shopping bags and garbage bags found in the top 10 plastic items disposed of account for 6.6% of all plastic waste disposed of (855 tonnes).

In the Pacific

- The top 10 plastic items account for 48.8% of all plastic waste disposed of during 2020 (13,863 tonnes).
- Single-use plastic (SUP) accounts for 50% of the top 10 plastics by polymer type. These items account for 30.5% of plastic waste disposal (8,671 tonnes).
- PET water containers in Table 9 account for 23% of all plastic waste disposal (3,209 tonnes).
- PS food containers account for 18% of the top 10 plastic items by polymer type. These items account for 9.2% of all plastic waste disposed of (2,631 tonnes).
- Hygiene waste (nappies and sanitary items) accounts for 33.7% of all plastic waste disposed of (9,568 tonnes).

Table 9: Caribbean vs. Pacific top 10 plastic items disposed in 2020

Carik %	bean Polymer	ltem	Polymer	Pacific %
9.2	PET 1	Water containers PET beverage containers water PE	T PETI	
9.2	PET 1	Other beverage containers PET other SUI	OTHER 7	7.8
7.7	LDPE 4	Soft plastic packaging SUP soft plastic packaging SUI	OTHER 7	
7.0	OTHER 7	Soft plastic packaging SUP soft plastic packaging SUI	D LDPE 4	
4.9	OTHER 7	other single use styrofoam takeaway food containers SUI	P PS 6	5.8
3.6	HDPE 2	light shopping plastic bags SUP garbage bags SUI	P HDPE 2	3.5
3.0	HDPE 2	garbage bags SUP food containers p	s PS 6	
2.5	PP 5	container lids pp other othe	r OTHER 7	
2.4	OTHER 7	Multi layered containers food semi rigid containers e.g trays Pl	P PS 6	
1.5	HDPE 2	Other HDPE food containers EPS P		

Appendix 2: Additional comparison

Table 10: Additional comparison between Caribbean and Pacific regions

	Caribbean	Pacific
Plastic imports vs. exports	Imports 14,595 tonnesExports 390 tonnes	Imports 43,316Exports 14,670
Waste disposal per sector	 Households 1.78 kg/person/day Commercial 5.97 kg/employee/day Tourism 6.23 kg/visitor/day Fisheries 2.14 kg/vessel/day The Caribbean tourism sector is nearly 22 times more likely to dispose of waste than the Pacific. 	 Households 0.14 kg/person/day Commercial 0.23 kg/employee/day Tourism 1.74 kg/visitor/day Fisheries 0.93 kg/vessel/day
Composition of waste disposed	 Organics accounted for 35% of waste. Plastics 5.2% 	Organics accounted for 53%Plastics 11%
Plastic disposal	 Households 0.17 kg/person/day Commercial 0.12 kg/employee/day Tourism 0.45 kg/visitor/day Fisheries 0.35 kg/vessel/day 	 Households 0.01 kg/person/day Commercial 0.04 kg/employee/day Tourism 0.17 kg/visitor/day Fisheries 0.24 kg/vessel/day
Plastics Leakage	• 9,566 tonnes	• 3,087 tonnes

Appendix 3: Key regional reports

- EIA (2020). Plastic Pollution Prevention in Pacific Island Countries: Gap Analysis of current legislation, policies and plans.
- JPRISM (2018). Practical Guide to Solid Waste Management in Pacific Island Countries and Territories.
- PRIF (2018). Pacific Region Solid Waste Management and Recycling Country & Territory Profiles.
- Raubenheimer, Karen (2019). Desktop studies on principles of waste management and funding mechanisms in relation to the Commonwealth Litter Programme (CLiP): Vanuatu and Solomon Islands. Cefas, University of Wollongong Australia.
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- World Bank (2020). Preventing Marine Plastics A Circularity Approach.
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Annex 4: Multilateral Environmental Agreements related to plastic waste in the Pacific

Table 11: MEAs related to plastic waste in the Pacific and associated reporting compliance (Source: adapted from Farrelly T. et al., 2020. Plastic Pollution Prevention in Pacific Island Countries: Gap analysis of current legislation, policies and plans and Progress on the road to sustainable development in the Pacific: Executive Summary. United Nations Economic and Social Commission for Asia and the Pacific. ESCAP/RFSD/2019/INF/6.UN ESCAP (2019))

Key: Current: within the Iast 2 years (2018-2020) 2-5 wars (2015-2017) then 5 years (2015-2017)

					1				i		4			t de la composición d	1		
INTERNATIONAL AGREEMENTS	Description	Pollu- tion source	REPORT ING PERIOD	Cook Islands	Federated State of Micronesia	UU	Kiribati	Marshall Islands	Nauru	Niue	Palau	BNG	Samoa	Solomon Islands	Tonga	Tuvalu	Vanuatu
SDGs: Voluntary National Review	Broad scope including pollution management.	Land and Marine	Varies		2020	2019	2018	In prepara tion (2021)	2019		2019	2020	2020	2020	2019		2019
BIODIVERSITY	Th. 010 has the second	6		_	_	-	_	-	-	_	-			_	-		_
Convention on Biological Diversity (CBD)	The CBD has three main objectives: 1) the conservation of biological diversity, 2) the sustainable use of the components of biological diversity, 3) the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.	Land and Marine	Sixth National Report was due in 2018	2014	2015	2014	2015	2014	2019	2014	2019	2014	2014	2014	2014	2015	2014
WASTE AND PO																	
HAZARDOUS WA	ASTE AND POLLUTION		F	-	_	-			-	-	-	-	-	-	-		
Basel Convention	Legally-binding global instrument on the transboundary movement of hazardous wastes and other wastes (plastics as other wastes).	Land	Due annually	2004	2002		2006	2014	2004			2004	2016				
Stockholm Convention	Legally-binding global instrument to control persistent organic pollutants.	Land	Last due in 2018														
ATMOSPHERIC I	POLLUTION								-		e						
Vienna Convention (Montreal Protocol)	Convention to restrict production and use of ozone depleting substances.	Land	Due annually	2019	2019	2019	2019	2019	2018		2019	2019	2019	2019	2018	2019	2019
SHIP-BASED PO	LLUTION		d (V 7		A		900 - 2	a 6		<i>0</i> 4	C.	30	2. V	
London Convention	Legally-binding global instrument listing prohibited pollutants and those requiring permits for dumping (intentional dumping into the sea).	Marine	Due														
Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter	Legally-binding global instrument listing prohibited pollutants and those requiring permits for dumping (intentional dumping into the sea).	Marine	annually, including NIL if no incidents														
Convention for the Prevention of Pollution from Ships (MARPOL)	Legally-binding global instrument almed at preventing both accidental pollution and pollution from routine vessel operations.	Marine	Due on incident												9		
CLIMATE CHAN	GE	Land	Due	_	-		-	6	_	-	-	_	-	-	-	-	
UNFCCC	Climate change convention 1993	Land and Marine	Due every 4 years*	2011	2013	2014	2013	2015	2014	2014	2019	2019	2010	2017	2012	2015	2016
REGIONAL AGR	Supports the regional	-	1			-	_	_		-			(_	-	-	
Walgani Convention	implementation of the international hazardous waste control regime (Basel, Rotterdam and Stockholm Conventions) and the London Convention.	Land	Due every 2 years	2013	2013	2013	2013		2013	2013	2013	2013	2013	2013	2013	2013	2013
Noumea Convention	In the event of a pollution emergency, prompt and effective action should be taken initially at the national level to organise and co-ordinate prevention, mitigation and clean-up activities.	Land	Due every 2 years					In process					2019				

Appendix 5: Regional bodies and function

Table 12: Regional bodies and functions (Source: UNEP, 2014)

	Regional body	Function
Waste	South Pacific Regional Environment Program (SPREP) https://www.sprep.org/	Provides assistance in order to protect and improve the Pacific environment and to ensure sustainable development for present and future generations. For example, SPREP contributes to Pacific engagement in United Nations Framework Convention on Climate Change (UNFCCC) negotiations.
Tourism	South Pacific Travel Organisation (SPTO) https://southpacificislan ds.travel/	Mandated inter-governmental body for the tourism sector in the region, with the mission to market and develop tourism in the South Pacific.
Fisheries	Forum Fisheries Agency (FFA) https://www.ffa.int/	An advisory body that assists members to strengthen national capacity and regional solidarity to maximise benefits from the conservation and sustainable use of their tuna fisheries resources. Alongside fisheries management and development assistance, the FFA operates the Regional Fisheries Surveillance Centre, which provides a central link for coordinated action against illegal, unreported and unregulated (IUU) fishing.
General	Secretariat of the Pacific Community (SPC) https://www.spc.int/	Delivers technical assistance, policy advice, and training and research services for the region. Its programmes span a number of sectors addressing sustainable economic development, natural resource and environmental management, and human and social development.
	Pacific Islands Development Program (PIDP) https://pidp.eastwestce nter.org/	Housed in the East-West Center in Hawaii, assists Pacific island leaders to advance their collective efforts to achieve and sustain equitable social and economic development consistent with the goals of the Pacific region's people.
	Pacific Aviation Safety Office (PASO) https://paso.aero/	Oversees aviation safety and security in the Pacific islands using guidelines provided by the International Civil Aviation Organisation (ICAO).
	Pacific Islands Forum (PIF) https://www.forumsec.o rg/	The region's principal political grouping. Established in 1971. The Forum's annual Leaders' Retreat is the peak regional political meeting for political discussions on deeper regional cooperation and integration.

Annex 6: Legislative theme matrix

Table 13: Global Objectives gap analysis of key documents using the analytical framework (Source: Farrelly t. et al. 2020. Plastic Pollution Prevention in Pacific Island Countries: Gap analysis of current legislation, policies, plans, and Progress on the road to sustainable development in the Pacific)

Environment Management Act 2005 and Regulations: Environment Management (Budget Anedment) Act 2019 Image: Construct on the second												
Country	Legislation	Long-term elimination of discharges	Safe circular economy for plastics	Intergenera- tional equity & justice	SDGs	Protection of human health	Vertical integration	Horizontal integration	Precautionary approach	Waste hierarchy	Climato Change	Plastic ban
	Regulations; Environment Management (Budget											
Fiji Fiji Kiribati Kiribati Satur Kiribati Satur Kiribati Palau Palau Palau	Regulations 1937 (as at 1 August 2018) [PHA 128]; and Public Health and Sanitary Services											
	Climate Change Bill 2019											
	Republic of Fiji Climate Change Policy 2012											
the there documents Country I Fiji I Kiribati I Country I Kiribati I I I Marshall I I I Palau I Papua Guinea I Papua Guinea I I I												
	Environment (Amendment) Act 2007					ť i		1				
Country I Fiji I Fiji I Kiribati I Country I Marshall I Islands I Palau I Palau I Papua I Palau I	Kiribati Solid Waste Management Plan											
	Kiribati 20-year Vision 2016–2036 or KV20											
	Kiribati Development Plan 2016–19					1						į.
	Customs Act 2019	· · · · · · · · · · · · · · · · · · ·										
Kiribati Country Marshali		Long-ter eliminat discharg	Safe cin econom plastics	Intergen tional ec & justice	SDGs	Protecti human 1	Vertical integrati	Horizon	Precauti approac	Waste	Climate Change	Plastic t
												i.
	Prohibition, and Container Deposit (Amendment)											
To land												
	Plastic Bag Use Reduction Act 2017											
Palau	Zero Disposable Plastic Policy, Executive Order No. 417											
	The National Solid Waste Management Strategy: the roadmap towards a clean and safe Palau 2017–2026											
	Environmental Contaminants Act 1978						Į	Ŀ—,	<u>.</u>			
New	Environment Act 2000											1
Guinea	Public Health Act 1973											
Fiji [Fiji [Kiribati] Country [Marshall] Islands [Marshall] Palau [Papua] Papua] Count] Count] Country [Count] Count]	STaR											
	Marine Pollution Prevention Act 2008											
	Samoa Water Authority Act 2003 - Samoa						2 A					
Samoa	Water Authority (Sewerage and Wastewater) Regulations 2009											

Country	Legislation	Long-term elimination of discharges	Safe circular economy for plastics	Intergenera- tional equity & justice	SDGs	Protection of human health	Vertical Integration	Horizontal Integration	Precautionary approach	Waste hierarchy	Climate Change	and a second second
	Waste (Plastic Bag) Management Regulations 2018											
	National Waste Management Strategy 2019– 2023		(, 1				Î
	National WMAP Strategy		l (1
Solomon Islands	The Environmental Health (Public Health Act) Regulations 1980											
Solomon slands	Environment Act 1998											
	Shipping (Marine Pollution) Regulation									1		Ĩ
Tonga	Waste Management (Plastic Levy) Regulations 2013											
	Environment Protection Act (2008) – Litter and Waste Control Regulations 2013											
	Marine Pollution Prevention Act] [
	Hazardous Wastes and Chemicals Act 2010											ĺ
	Ozone Layer Protection Act											
	Waste Management Act 2017											1
	Waste Management (Litter and Waste Control) Regulations 2018											
	Waste Management (Levy Deposit) Regulation 2019											
Tuvalu	Waste Management (Prohibition on the Importation of Single-Use Plastic) Regulation 2019											
	Environment Protection Act (2008) – Litter and Waste Control Regulations 2013											1
	Ozone Layer Protection Act (2008)											
Tonga Tuvalu Country	Integrated Waste Policy and Action Plan 2017– 2026											Ĭ
Country	Legislation	Long-term elimination of discharges	Safe circular economy for plastics	Intergenera- tional equity & justice	SDGs	Protection of human health	Vertical Integration	Horizontal integration	Precautionary approach	Wasto hierarchy	Climate Change	V ISOUCH MANAGER 1
	National Action Plan to Reduce Releases of Unintentional Persistent Organic Pollutants 2018–2022											
Vanuatu	Waste Management Act 2014											Γ
	Regulations 2018							ļ.				Γ
	Ozone Layer Protection Act 2010			9 2	3	2	6	9	1		8	Г

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Layout by: Mireia Villalonga



INTERNATIONAL UNION FOR CONSERVATION OF NATURE

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WORLD HEADQUARTERS Rue Mauverney 28 1196 Gland, Switzerland Tel +41 22 999 0000 Fax +41 22 999 0002 www.iucn.org