



## Introduction

The increasing presence of plastic marine debris in the South Pacific Ocean is focusing attention on strengthening recycling policies and systems in the region. Unique challenges associated with shipping commodities of low value over long distances to recycling markets, however, reduce the economic viability to do so. This country profile includes the current technologies, material flow, logistics, public policies, institutional framework, financial mechanisms, and initiatives that are being designed or have been implemented to strengthen recycling systems in Tuvalu.

Tuvalu, with 26km<sup>2</sup> of land area and 24km of coastline, lies in the Polynesia region of the Western Pacific Ocean, midway between Hawaii and Australia. With its capital Funafuti, it comprises nine islands, of which three are reef islands and six are low-lying atolls.



Tuvalu has a central government and eight *Kaupules* (island councils) that bring together the traditional responsibilities of the assembly of elders for each island. *Kaupules* also assemble with the elected council to deliver land and lagoon transport services, provide assistance in mechanical and joinery activities, and maintain roads, public facilities, and beach ramps.

The population in 2011 was estimated at 11,206, mostly in the only urban area, the capital Funafuti, which is located on the island of the same name (GoT, 2017). The remaining 41% (or 4,594) of residents live in rural areas on the outer islands (Knoema, 2015). The approximate population distribution across the electoral districts (islands) of Tuvalu is shown below.

| Tuvalu                                      |            |
|---------------------------------------------|------------|
| Island                                      | Population |
| Nanumea                                     | 544        |
| Niutao                                      | 606        |
| Nanumaga                                    | 481        |
| Nui                                         | 542        |
| Vaitupu                                     | 1,555      |
| Nukufetau                                   | 536        |
| Funafuti, including the capital of Funafuti | 6,025      |
| Nukulaelae                                  | 324        |
| Niulakita                                   | 27         |

## Socioeconomic background

Tuvalu is the fourth smallest nation in the world and one of the most remote. Considered timeless and steeped in traditional customs, the not-yet-commercialised, peaceful location and spectacular marine environment attract increasing numbers of visitors. The number of tourists in 2016 (2,465) reflected a 5.2% increase over the previous year (SPTO, 2017).

Tuvalu's atolls are extremely vulnerable to the impacts of climate change, threatening the country's security and survival. Potable water and arable land are limited. The Government of Tuvalu, in 2015, established the Tuvalu Survival Fund to finance the response to the impacts of climate change. The government also aims to promote a 100% transition to renewable energy sources by 2020 to replace the diesel-powered electricity generation systems on eight islands.

Tuvalu's gross domestic product in 2015 was US\$32.7 million/US\$3,930 per capita (OEC, 2017). Its trade balance deficit stood at US\$19.2 million, with exports at US\$37.4 million (+20.6% annualised) and imports at US\$56.5 million (-3.2% since 2010).

Tuvalu's main export market destinations in 2015 were Australia, the People's Republic of China, the Republic of Korea, Japan, and Thailand. The main import origins in the same year were Australia, the People's Republic of China, Fiji, Japan, and New Zealand.

## Solid waste management

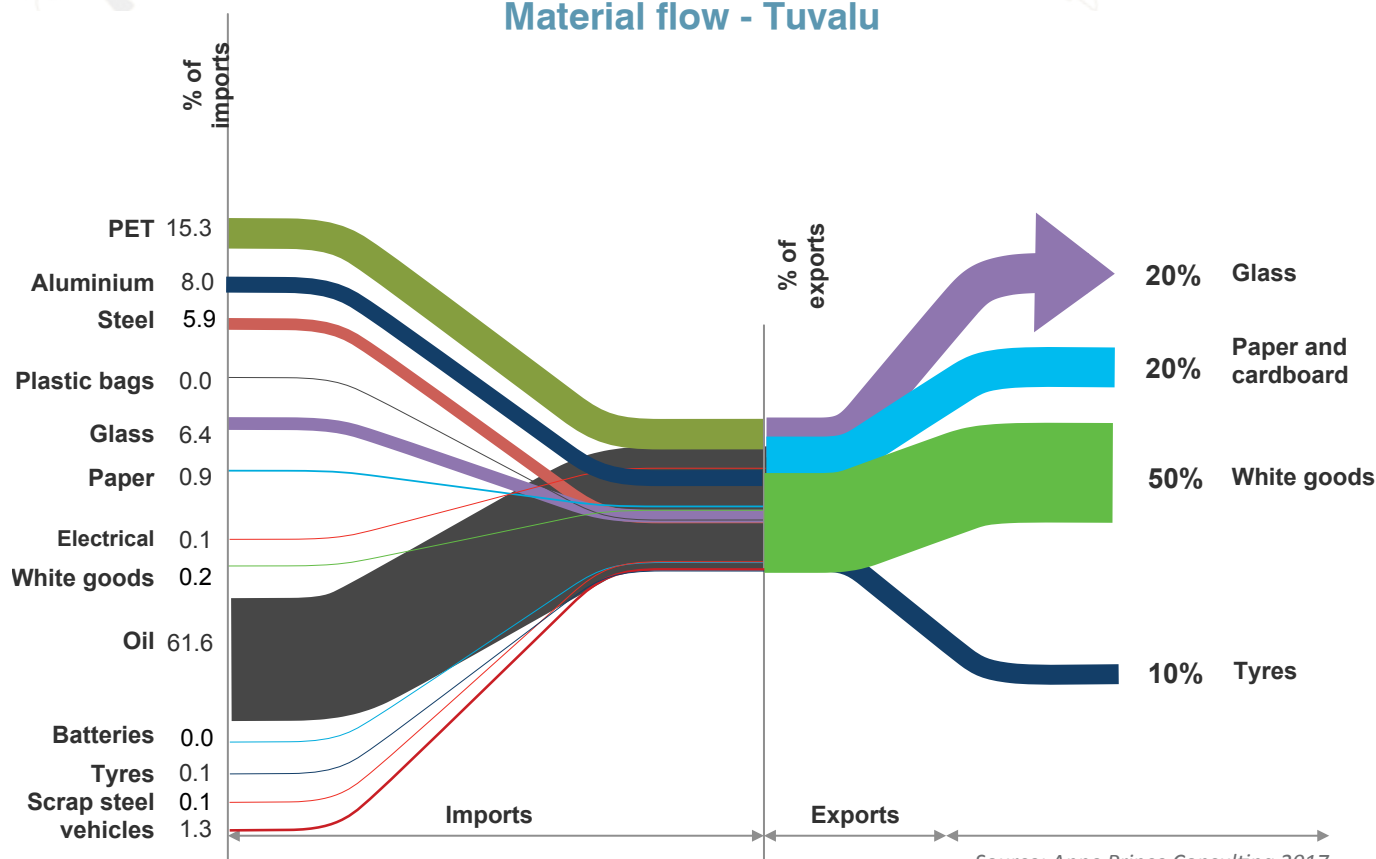
A waste composition survey, conducted in 2017, found that daily municipal waste was 0.42kg per person, comprising an estimated 60% organic, 15% nappies, 5% paper, 7% plastics, and the remaining 13% comprising metals, glass, textiles and other materials. According to a World Bank study, daily per capita waste generation is estimated at 1.2kg (World Bank, 2012).

The material flow chart below is based on an analysis of Tuvalu's imports of the 15 material categories studied, averaged over a seven-year period to 2016, compared with exports of those recovered recyclable materials, averaged over a two-year period 2015-2016, presented as a percentage of the total of the 15 categories. (UN Comtrade, 2017).

The number of imported polyethylene terephthalate (PET) bottles for fruit juices and fermented drinks increased, while there was a sharp drop in those for water. Plastic bags entering the country decreased and paper and cardboard held steady. Palm oil imports continue to rise as do crude oil and motor vehicles.



## Material flow - Tuvalu




Source: Anne Prince Consulting 2017

Note: The percentage of imports and exports displayed relate only to the proportion of the 15 materials categories studied, not total imports/exports

Evidence in 2014-16 data indicates that there were only two major exports from Tuvalu: white goods and tyres. This indicates that there is substantial waste material of the type reflected in this profile, a solution for which is essential.

Modelling of potential recovery of recyclable materials, presented in the table below, is based on an estimated average daily per capita municipal solid waste generation of 0.79kg (*World Bank, 2012*). It also applies a range of location-specific estimated recovery rates that are based on a set of assumptions of existing or introduced incentive-based policies and programs, such as container-deposit schemes and import levies. The resulting ratios were used to estimate average annual tonnages that could be recovered for recycling. (*JICA, 2013; SPREP 2016; Mobile Muster, 2013; DOEE, 2017; Jambeck et al., 2015; MFAT, 2016; UNIDO/ICSHP, 2013*).

| Tuvalu                                               |                         |
|------------------------------------------------------|-------------------------|
| Recyclable Materials Forecast                        | Estimated Metric Tonnes |
| Polyethylene terephthalate (PET) beverage containers | 25                      |
| Aluminium cans                                       | 49                      |
| Glass beverage containers                            | 35                      |
| Steel cans                                           | 39                      |
| Plastic shopping bags                                | 16                      |
| End-of-life (EOL) renewable energy equipment         | 0.20                    |
| Paper/cardboard                                      | 163                     |
| E-waste                                              | 0.54                    |
| White goods                                          | 5                       |
| Used motor/cooking oil                               | 63                      |
| Used lead-acid batteries                             | 4                       |
| Lithium batteries                                    | 7                       |
| Scrap steel/nonferrous metals                        | 59                      |
| EOL tyres                                            | 4                       |
| EOL vehicles                                         | 72                      |
| <b>Total</b>                                         | <b>542</b>              |



Tuvalu has received support from Japan International Cooperation Agency under the first phase of its Promotion of Regional Initiative Solid Waste Management project. The project aims to build capacity and improve solid waste management, including provide training in the operation of landfills.

Tuvalu also received support from the EU and SPREP in developing the Tuvalu Integrated Waste Policy and Action Plan 2017-2026 which includes strategic actions and targets for 3R and Return operations.

## Future waste management

Future increases in recovered materials are expected to result from the PacWaste (2013-18) program, implemented by the Secretariat of the Pacific Regional Environment Programme. The PacWaste Project assisted Tuvalu on medical waste through providing medium waste incinerator and co-financed with DWM to conduct baseline survey and CBA for Green Waste.

Resource recovery programs are expected to be enhanced also through the EU funded PacWaste Plus (2018-2022), which will be implemented by SPREP and Sustainable Waste Program in Tuvalu (2018-2022).

Since 2007, various donor-funded projects have seen to the installation or improvement of renewable energy systems. Under its Energy Sector Development Project, the World Bank partnered with the European Union (EU), Government of New Zealand, and Government of the United Arab Emirates (UAE-Pacific Partnership Fund) to support the installation of systems for solar and wind-powered electricity, as well as battery storage in Funafuti and PV-diesel hybrids systems on eight outer islands (ADB, 2017; MFAT, 2016).

Approximately 98% of Tuvalu's population has access to electricity. As such, it is expected that there will be an increase in household electrical items and end-of-life renewable energy equipment in the country's waste stream. To help address this, the Pacific Region Infrastructure Facility has provided technical support for the Tuvalu Infrastructure Strategy and Investment Plan. This aims to create initiatives to improve solid waste management on the outer islands and support the construction of landfills.

## Plastic marine debris

Mismanaged plastic waste eventually enters the marine environment by way of inland rivers and waste water outfalls or is transported by wind and tide. Rigid and light-weight plastic materials from products that are daily consumed or used become marine debris if not managed appropriately. An estimated 12% of Tuvalu's waste stream is made up of plastic.

The islands of Tuvalu have a combined coastline of 24km, and a recent study (Jenna et al., 2015) indicates a daily plastic waste generation of approximately 1.7 tonnes (t). Of this, an estimated 1.3t is mismanaged, entering the marine environment through release from uncontained disposal sites or by direct littering. An estimated 457t of plastic waste were released in the waters around Tuvalu in 2010, forming marine debris. If not addressed, the amount is expected to rise to 861t by 2025.

Of the 1.7t of plastics generated each day, approximately 0.18t may comprise PET or high-density polyethylene (HDPE) plastic that is eligible for recovery under a container deposit scheme (CDS). Based on an average reduction rate of 40% in mismanaged waste with a CDS in place, approximately 0.06t of PET and HDPE plastic could be recycled each day. This could increase to an 80% or above reduction rate, depending on access to recycling collection services and viable markets, among others. Nonetheless, a 40% reduction in mismanaged PET and HDPE would result in approximately 437t of plastic becoming marine debris each year.

The outcome of mismanaged plastic can be divided into three primary groups: plastic that remains on the surface of the sea as floating debris, plastic that sinks to the ocean floor, and plastic that washes up on beaches. A CDS that recovers 40% of HDPE and PET bottles in Tuvalu may achieve the following reductions in marine debris each year:

- 3t floating plastic
- 14t in sunken plastic
- 3t in beach plastic.

Further benefits attributed to a CDS are possible with a reduction in annual damage costs to Tuvalu's 57 local fishing vessels (approximately US\$440). If beaches were cleaned up, over US\$5,128 would be saved, of particular relevance to the amenities of coastal communities and the tourism sector.

## Infrastructure and services

In Funafuti, household waste is stored in 120 litre and 80 litre waste bins for weekly collection. This service is provided to around 100% of residences by the Funafuti *Kaupule*, which operates two flat-tray collection vehicles.

The Water, Waste and Sanitation Project, funded by the EU and completed in 2013, achieved an upgrade in waste services. Nevertheless, collections often are interrupted due to mechanical issues and ad hoc service arrangements that result in waste either not being gathered over long periods or being illegally dumped or burned.

The same programme supported the purchase of new trailers with waste cages for the collection of recyclables. It is understood that these have been distributed to the *Kaupules* of the outer islands.

Tuvalu's Department of Waste Management maintains large communal waste bins in public locations in Funafuti. A small recycling service is provided by the local recycler. The collection of green waste and conversion to compostable materials is undertaken in Funafuti and there are potential opportunities for improvement and expansion to the Vaitupu island.

While in the past waste was often disposed of in "borrow pits" around Funafuti, which have been excavated during World War II to build the airport runway, this practice has stopped thanks to the rehabilitation of the borrow pits completed in 2016 by the Government of Tuvalu with support from New Zealand.

While the capacity of the main disposal site in Funafuti is depleted, an EU-funded rehabilitation programme is underway to extend the life of the facility beyond 2025. Competing pressure from economic and social



redevelopment plans make it a significant challenge to identify an alternative site, as is the case on the outer islands where disposal facilities are rudimentary. A new waste transfer station and a recycling centre, funded by the Government of Tuvalu, are in the process of construction on the island of Funafuti, expected to open by end of April 2018.

The Taipei (China) Technical Mission operates a greenwaste shredder at its composting facility, which sells the compost to farmers and householders as fertilizer. A small private sector operator in Funafuti recovers ferrous and nonferrous metals from the disposal site for export to Australia and New Zealand.

Previously, aluminium cans had been recycled under a programme supported by a nongovernment organisation. Subsequent to having exported 70t a year of the material to New Zealand, the programme was disbanded due to the organisation's lack of financial viability.

A further EU project (2018-2022) focuses on efforts to increase the recycling capacity of the private sector. So far, a baler to prepare aluminium and steel cans for export has been purchased

## Logistics

Tuvalu has one international seaport and container terminal at Funafuti. This is operated by the Department of Marine and Port Services under the Ministry of Communication and Transport.

The terminal at the Port of Funafuti is approximately one hectare and has a main quay that is 80 metres long and a warehouse. There is neither a shore crane nor are there private stevedore services available.

The Port of Funafuti is capable of handling 1,000 TEU per year. The port has a current through put of approximately 1,000 import, 100 export and the return of 900 empty containers each year which may potentially be made available for reverse logistic arrangements.

This port is not on a cost-effective route and is only serviced by the Pacific Direct Line. Estimated TEU shipping container rates, presented below, are based on the cargo of nonhazardous goods, inclusive of un/loading and a bunker adjustment factor. They do not account for customs clearance, duties, and quarantine inspection.

| Tuvalu: Shipping Lines                                     |          |                  |
|------------------------------------------------------------|----------|------------------|
| AUSPAC Consortium; Kyowa Shipping Co. Ltd.; Polynesia Line |          |                  |
| Destination                                                | Schedule | Est. USD per TEU |
| Fiji                                                       | 21-day   | 3,200            |

Source: AMSTEC Pty Ltd

Notes: USD = U.S. dollar; TEU = twenty-foot equivalent unit.

Through its shipping agent, Trade Pacific Shipping Agency Ltd., the Government of Tuvalu operates an inter-island shipping service, consisting of two passenger/cargo ships and an ocean going barge. With the recent addition of a new ship, the current two-month schedule for inter-island transport is expected to expand to increase service. The ships also move cargo and passengers between Fiji and Tuvalu. The estimated rate for a 20 foot shipping container between Funafuti and the outer island of Nanumea is US\$1,600 (JICA, 2013).

The Tuvalu Infrastructure Strategic Investment Plan (PRIF 2017) aims to upgrade container storage and handling facilities at the Port of Funafuti. The Asian Development Bank will assist in the construction of harbours on four outer islands to accommodate small working boats to load and unload cargo from inter-island vessels.

## Institutional framework

Data relating to the institutional framework of Tuvalu have been gathered from the database of the Pacific Islands Legal Information Institute (PacLII, 2017). ECOLEX is also an information service that relates to environmental law (ECOLEX, 2017), from which various data also have been collected.

The Ministry of Home Affairs and Rural Development is responsible for local government and the administration of *Falekaupule* (Local Government) Act 1997. The Act places responsibility to councils for waste collection services and ensures public places are free of rubbish.

The Ministry for Home Affairs administers the Environment Protection (Waste Reform) Amendment Act 2017 through the Department of Waste Management of Tuvalu. The latter regulates and monitors the compliance of waste collection and disposal systems across Tuvalu, develops national waste strategies, and provides public awareness programs and technical guidance to waste management operators.

Department of Waste Management of Tuvalu ensured the implementation of Integrated Solid Waste Plan 2005-2010. It also has developed Tuvalu National Waste Policy and Action Plan 2017-2026 and has recently completed a Performance Review of the country's Integrated Waste Action Plan for 2017-2026.

The Ministry of Foreign Affairs, Trade, Tourism, Environment and Labour administers Environment Protection Act 2008. Environment Protection (Environment Impact Assessment) Regulations 2014 established the Environmental Assessment Task Force and the procedures for preparing environmental impact assessment reports for all developments.

Environment Protection (Litter and Waste Control) Regulations 2013 prohibits the burning and disposal of waste in or near water sources, beaches and foreshores, mangroves, and directly into the sea. This regulation also bans the disposal of white goods and e-waste in landfills, as well as regulates the transport, storage, and disposal of prescribed waste. Funafuti *Kaupule* under the direction of the Department of Waste Management, has a Garbage Disposal By-Law, prohibiting the dumping of garbage beyond designated disposal sites.

Marine Pollution Act 2008 prohibits the discharge from ships of oils, garbage, and sewerage into the sea; empowers the harbour master to provide reception facilities for these materials at port; and gives effect to a number of international conventions for the prevention of marine pollution. Merchant Shipping Oil Pollution Order 1975 also controls marine pollution.

The Tuvalu Infrastructure Strategy and Investment Plan (PRIF 2017) prioritises the consolidation of Funafuti and outer island landfills; collects import tariffs to fund solid waste management activities; and creates initiatives to facilitate private sector recycling and reuse activities. Included among the goals of National Strategy for Sustainable Development 2016-2020 (titled *Te Kakeega III*) are the upgrading of waste management infrastructure and operations, particularly on the outer islands, and the development of a national waste management policy. *Te Kakeega III* also aims to improve sea transport between the eight outer islands for the movement of cargo and passengers.

While Tuvalu is not a signatory to the Convention on the Control of Trans-boundary Movements of Hazardous Wastes and Their Disposal, it is a party to various other multilateral environmental agreements and conventions, listed in the table below.

| Tuvalu                                                                                                                                                                               |          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Multilateral Agreements and Conventions                                                                                                                                              | Status   |
| Stockholm Convention on Persistent Organic Pollutants                                                                                                                                | Ratified |
| 1995 Waigani Convention                                                                                                                                                              | Ratified |
| Montreal Protocol                                                                                                                                                                    | Ratified |
| MARPOL 73/78: International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 (Annex I/II, III, IV, V, and VI)                         | Ratified |
| International Convention on Civil Liability for Oil Pollution Damage 1969 (renewed 1992)                                                                                             | Ratified |
| International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (FUND), 1971                                                        | Ratified |
| International Convention on the Protocol of 1992 to Amend The International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971 | Ratified |
| International Convention on Civil Liability for Bunker Oil Pollution Damage (BUNKER) 2001                                                                                            | Ratified |
| International Convention on the Control of Harmful Anti-fouling Systems in Ships (AFS Convention) 2001                                                                               | Ratified |
| International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM)2004                                                                              | Ratified |
| Nairobi International Convention on the Removal of Wrecks 2007                                                                                                                       | Ratified |

SPREP, 2016.

## Financial mechanisms

Currency: Tuvaluan dollar; Australian dollar (A\$)

The Funafuti *Kaupule* levies an annual household fee of approximately A\$40 and a commercial fee that ranges between A\$110 and A\$140 for waste collection services. These charges, however, fall short of covering costs. Tipping fees are not charged for waste that enters the dumpsite.

Funds are transferred to island councils from the national government on an annual basis. Of the total annual grant, 63% is conditional and 37% is non-conditional. The Government of Tuvalu allocated in 2016 around A\$900 000 to support Department of Waste Management programs including operations. Funding, however, continues to be insufficient and consideration now is placed on the introduction of a waste management levy on imported goods. It is proposed that a green fund be created from airport departure taxes to raise the necessary reserves to enhance Tuvalu's waste management practices.

## Conclusions

Waste management in Tuvalu is governed by environmental laws. A long-term policy to 2026 is being developed, as is an implementation plan to 2021. The current waste collection coverage for Funafuti (Main Island) is 100% but 80% for all outer islands.

Recent additions to inter-island shipping services and the planned renovation of harbours on the outer islands should support a country-wide CDS. It should also be conducive to an extended producer responsibility scheme in the future.

The Port of Funafuti is small and has standard infrastructure. It lacks the capacity to handle increased cargo volume. There is a forthcoming project to boost container storage capacity and handling facilities.

## Abbreviations

|                 |                                                  |
|-----------------|--------------------------------------------------|
| ADB             | Asian Development Bank                           |
| AFS             | Anti-fouling systems                             |
| BWM             | Ballast water and sediments                      |
| CDS             | Container deposit scheme                         |
| DOEE            | Department of Environment and Energy (Australia) |
| EOL             | End of life                                      |
| EU              | European Union                                   |
| HDPE            | High-density polyethylene                        |
| ICSHP           | International Centre on Small Hydro Power        |
| JICA            | Japanese International Cooperation Agency        |
| kg              | kilogram                                         |
| km              | kilometer                                        |
| km <sup>2</sup> | square kilometres                                |

|        |                                                                     |
|--------|---------------------------------------------------------------------|
| MARPOL | International Convention for the Prevention of Pollution from Ships |
| MFAT   | Ministry of Foreign Affairs and Trade (New Zealand)                 |
| PET    | Polyethylene terephthalate                                          |
| PV     | Photovoltaic                                                        |
| PRIF   | Pacific Region Infrastructure Facility                              |
| SPREP  | Secretariat of the Pacific Regional Environment Program             |
| t      | tonne                                                               |
| TEU    | Twenty-foot equivalent unit                                         |
| UAE    | United Arab Emirates                                                |
| UNIDO  | United Nations Industrial Development Organisation                  |
| USD    | United States dollar                                                |

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