

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 Solomon Islands.

Solomon Islands is a group of six major islands and 900 small islands, stretching across 28,400km², with a combined coastline of 5,313km. The country is geographically placed east of Papua New Guinea and northwest of Vanuatu in the Melanesia region of the Pacific Ocean. The main islands are Guadalcanal - the largest of the Choiseul group of three islands - Santa Isabel, Malaita, New Georgia, and Makira (or San Cristobal). The capital, Honiara, is located on Guadalcanal Island.

Socioeconomic background

Solomon Islands consists of a group of mountainous islands and low-lying coral atolls. Ecotourism activities, such as scuba diving, continue to grow, despite increasing concern for the natural marine environment and the demise of the coral reefs. Furthermore, the lack of infrastructure and transport services presents development challenges in this sector. With tourism a significant industry in Solomon Islands, visitors numbered 21,623 in 2015 (RTRC, 2015), representing a 7.7% increase over the previous year.

Approximately 16% of the population is powered by the electricity grid. The state-owned power utility is almost entirely dependent on diesel generators to supply power to Honiara. The Province of Malaita receives only 2% of the power generation capacity, and many rural areas now use small PV panels. Power supply, in general, remains unreliable and costly, although the government is targeting an increase in renewable energy to 50% by 2020. The Asian Development Bank (ADB), together with other development partners, is funding the Tina River Hydro Development Project. It also has implemented the Solar Power Development Project to support transition to hydroelectric power.

The country's gross domestic product in 2015 (OEC, 2017) was US\$1.13 billion or US\$2,200 per capita. Its trade balance was US\$210 million, with exports at US\$648 million (+10.8% annualised) and imports at US\$438 million (+4.8% since 2010).

The primary export market destinations for 2015 were the People's Republic of China, India, Italy and the United Kingdom. The main import origins for the same year were Australia, the People's Republic of China, Malaysia, New Zealand and Singapore. (OEC, 2017).

Many Solomon Islanders engage in subsistence agriculture. The major contributors to gross domestic product in 2017 were agriculture at 39% and the service sector at 55%. Manufacturing, as a value adding sector, is relatively small, standing at 3.76% and indicating limited capacity to support process-based enterprises (GlobalEDGE, 2017).

The population of Solomon Islands in 2016 was estimated at 639,418 (GoSI, 2017), distributed over 10 provinces, as shown in the table below. Approximately 78%, or 498,746, live in rural areas (Knoema, 2015), the majority as subsistence farmers. The largest urban population is in the rapidly growing capital of Honiara. An estimated 35% of Honiara's population lives in informal settlements surrounding the capital city.

Solomon Islands		
Province	Population	Urban Centre
Choiseul	33,370	Taro
Western	92,319	Munda and Noro
Isabel	32,434	Buala
Central	30,837	Tulagi
Rennel	3,823	
Guadalcanal	133,790	
Honiara City	82,485	
Malaita	155,457	Auki
Makira	50,625	Kirakira
Temotu	24,278	Lata

Source: Solomon Islands National Statistics Office, Project Population by Province 2010-2025

A significant level of support has been provided to improve waste management under the first of two phases of the Promotion of Regional Initiative Solid Waste Management project (J-PRISM I), funded by the Japan International Cooperation Agency (JICA). Various core planning and infrastructure improvements were achieved during FY2014/15.

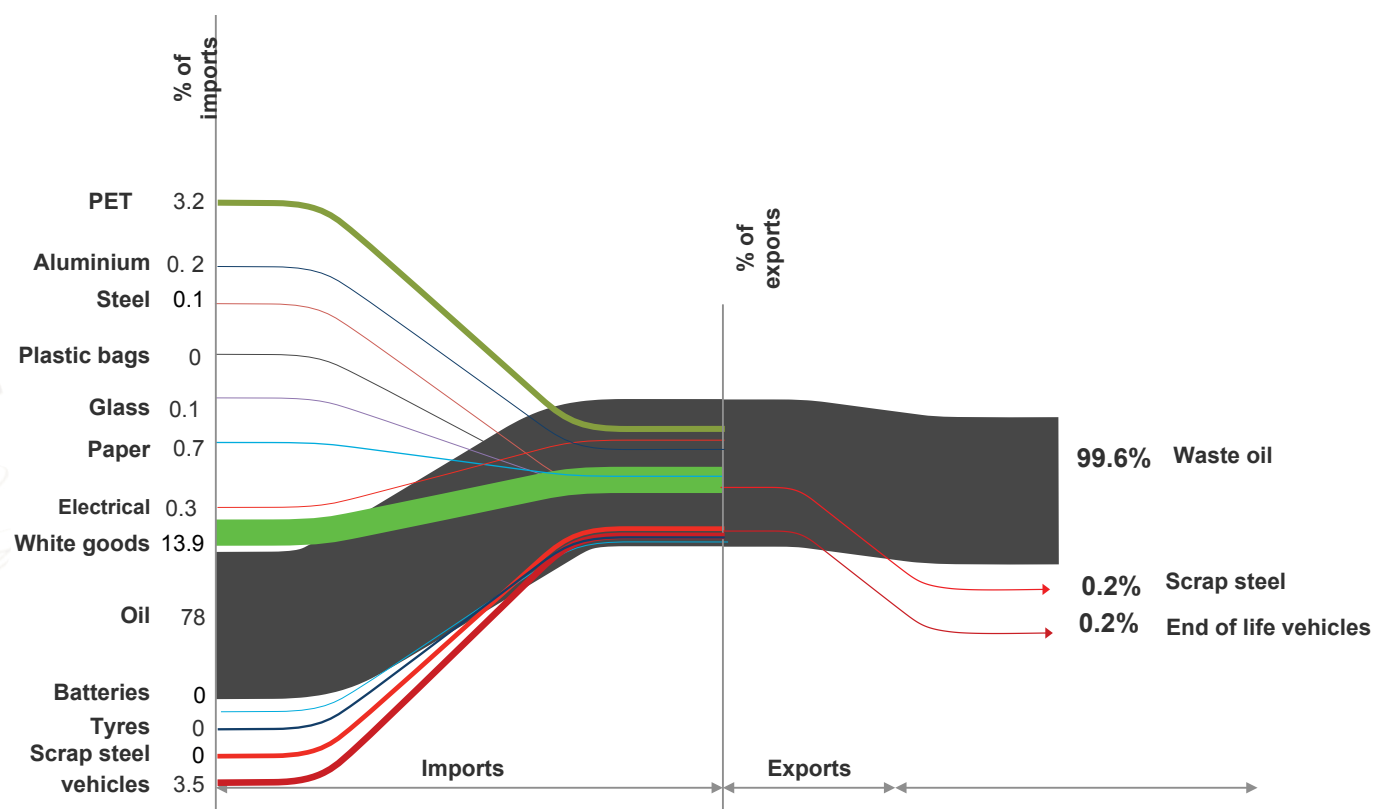
Solid waste management

A 2011 study on the characteristics of waste, supported J-PRISM I, demonstrated that the household waste generation rate in Honiara and Gizo is 0.9 kg per day.

The regional study coordinated by PRIF models the potential recovery of 15 materials types. A defined set of recovery rates was applied to the urban, rural, and outer island population distribution to calculate Solomon Islands potential recovery tonnage. The PRIF study compares various data to establish the context for the 15 waste materials.

The material flow chart below is based on an analysis of Solomon Islands 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).

Material flow - Solomon Islands



Source: Anne Prince Consulting, July 2017

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

Importation of polyethylene terephthalate (PET) beverage containers for fruit juice and flavoured drinks steadily increased from 2009 to 2016. A similar trend is taking place in terms of other beverage containers. There is also a steady rise in paper products coming into the country over the course of 2009 to 2016. The number of televisions and other electronic items are holding steady, while a large amount of crude oil is imported each year, although this appears to have peaked in 2011. A large number of vehicles were imported in 2010 after nearly five years of low volume. This, however, picked up again in 2015 and 2016.

Three major items exported were used motor and cooking oils and vehicles, following the general trend of other Pacific island countries. Otherwise, very little or no export was noted relating to beverage containers, plastic bags, e-waste, paper, and cardboard.

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; DOE, 2017; Jambeck et al., 2015; MFAT, 2016; UNIDO/ICSHP, 2013).

Solomon Islands	
Recyclable Materials Forecast	Metric Tonnes
Polyethylene terephthalate (PET) beverage containers	111
Aluminium cans	200
Glass beverage containers	141
Steel cans	159
Plastic shopping bags	72
End-of-life (EOL) renewable energy equipment	-
Paper/cardboard	666
E-waste	15
Whitegoods	139
Used motor/cooking oil	1,055
Used lead-acid batteries	33
Lithium batteries	197
Scrap steel/non-ferrous metals	239
EOL tyres	33
EOL vehicles	1,973
Total	5,033



Future waste management

Future increases in recovered materials are expected as a result of the PacWaste (2014-17) programme, implemented by SPREP. The programme aims to improve the management of e-waste and used lead-acid batteries. Activities include the establishment of a used lead-acid battery and mobile phone collection system, as well as support in developing a national e-waste strategy (SPREP, 2017).

The second phase of the Promotion of Regional Initiative Solid Waste Management (JPRISM II) project, implemented by JICA in early December 2016, will support capacity building in waste management. Target initiatives include improved governance and human resource development, which are expected to increase the volume of recoverable materials.

Currently, around 23% of the population of Solomon Islands has access to electricity, largely powered by diesel, while the contribution of renewables such as hydro and solar is targeted to increase to 20% of electricity generation by 2020. Projects funded by ADB, World Bank's International Development Association and various Climate Investment Funds, the private sector and the Governments of UAE, Australia and Solomon Islands aim to install five solar-diesel hybrid and battery storage systems and various hydropower-diesel hybrid systems to meet 65% demand (ADB, 2017). Other ongoing projects include upgrades to diesel power stations, hydro systems, and solar power and battery storage systems.

The transfer to renewable energy systems and increasing household access to electricity is anticipated to generate more household electrical items. As a result, there will be more end-of-life renewable energy equipment in the waste stream in the future.

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 from products that are consumed or used daily become marine debris if not managed appropriately. An estimated 13% of Solomon Islands waste stream consists of plastic.

Solomon Islands has a combined coastline of 5,313km, and a recent study (Jenna et al., 2015) indicates a daily plastic waste generation of approximately 63.2 tonnes (t). An estimated 55.8t are mismanaged daily and are predicted to enter the marine environment through release from uncontained disposal sites or by direct littering. An estimated 20,394t of plastic waste was released in the waters around Solomon Islands in 2010. If not addressed, the amount is expected to rise to 176,589 t by 2025.

Of the 63.2t of plastic generated each day, approximately 7t may comprise PET or high-density polyethylene (HDPE) plastic, eligible for recycling under a container deposit scheme (CDS).

Based on an average reduction rate of 40% in mismanaged waste with a CDS in place, approximately 2.47t 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 19,491t of plastic becoming marine debris each year.

The outcome of mismanaged plastic can be divided into three 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 plastic bottles in Solomon Islands may achieve the following reductions in marine debris each year:

- 135 t in floating plastic
- 632 t in sunken plastic
- 135 t in beach plastic.

Further benefits attributed to a CDS are possible with a reduction in annual damage costs to the 318 local fishing vessels of Solomon Islands (approximately US\$2,472). If beaches were cleaned up, over US\$229,000 would be saved, of particular relevance to the amenities of coastal communities and the tourism sector.

Infrastructure and services

Information relating to the solid waste and recycling infrastructure and services is sourced from *Solid Waste Management in the Pacific: Solomon Islands Country Snapshot*. 2014 Asian Development Bank, Manila. Information has also been drawn from the Regional Resource Circulation and Recycling Network Project Survey Return, Government of Solomon Islands.

Most provinces have some form of waste collection system in place, coordinated by the respective provincial departments under the Environmental Health Division. Approximately 60% of households in Honiara and 12% of the rest of the population have access to collection services. Plans to improve waste management in the provinces include a waste management strategy for Choiseul Province and a waste management action plan for Taro Island.

In Honiara, the collection of household waste is delivered by contractors employed by the city council. The city is divided into residential zones and contractors generally use 3t open trucks for collection. Collection, however, is often unreliable and waste is often left uncollected on the street for long periods of time. A collection service generally is not provided in the settlement areas around Honiara and, more often than not, waste is dumped into drains, eventually washing into streams, rivers, and the ocean during rainy periods. There are no household recycling collection services.

There are currently no sanitary landfills and the largest disposal site is the Ranadi landfill in Honiara, which is located on flat, reclaimed land. Adjacent to mangrove wetlands, the site receives residential, commercial, and industrial waste, collected by Honiara City Council. There is no waste segregation at the landfill, although waste pickers recover scrap metals and other materials of value. The site has a warehouse and baler to compress and store PET plastic.

A 2015 J-PRISM I initiative by JICA undertook rehabilitation work at the Ranadi Landfill and Gizo Dump to set up waste cells and leachate management systems in line with the semi aerobic Fukuoka method of technology. A training centre and perimeter fence at Ranadi were also erected, with upgrade work supported by those trained, as well as guided by operating manuals developed for on-site use. This initiative also included waste characterisation surveys and time and motion studies in Honiara and Gizo to inform the improvement of waste collection services.

There is one recycling firm in Gizo Western Province that purchases aluminium cans from residents. These are shipped to a recycler in Honiara for export. A PacWaste pilot project collects used lead-acid batteries from household solar systems in the provinces of Malaita, Santa Isabel, and Choiseul in the outer islands. These also are transported to Honiara and exported.

Honiara is the main recycling hub, where five recycling companies provide services in marked collection vehicles at which people return their aluminium cans for a redemption fee. The batteries are transported to the Solomon Island Power Warehouse for payment. While aluminium cans and ferrous and nonferrous metals are exported, a PET bottle collection project in Honiara has met challenges in accessing the international recycling market. The project is now under the responsibility of the Honiara City Council.

Reuse initiatives for a range of other materials exist across the island nation. For instance, cardboard is collected and used by a local firm to package coral for export. Used engine oil from the Solomon Power Station is salvaged and used as chainsaw oil or sold as vehicle oil on the local market; vehicle tyres are used by residents in their gardens; PET bottles are reused for lemonade drinks and arts and crafts to sell at markets; and some PET bottles are used as containers for growing vegetables.

Similarly, office paper is useful for early childhood teachers; magazines and coloured paper are made into beads for jewelry and sold at local markets; and newspaper is used for cooking. Nevertheless, the reuse of such materials is small in scale, with most becoming litter or discarded for transport to landfills.

Solomon Breweries Ltd. operates a bottle reuse scheme whereby glass bottles are redeemed by retail distributors at SI\$0.50 a bottle. Some tourist accommodations similarly recycle bottles and aluminium cans, ultimately for export.

While a number of recyclers in Solomon Islands use shipping containers to store materials, there are two that have warehouse facilities—one perhaps with a baler. Other than a shipping container for the storage of aluminium cans in Gizo, there are no storage facilities on other outer islands.

Logistics

Solomon Islands has four international ports that are operated by the Solomon Islands Port Authority. These are located in Honiara on the island of Guadalcanal, Noro on Kohinggo Island (or Arundel Island in the New Georgia island group), Viru Harbour in the New Georgia island group, and Yandina on Pavuvu Island in the Russell Islands.

Solomon Islands: Shipping Ports



Source: Google Maps.

(A) Shortland Harbour; (B) Malloco Bay; (C) Gizo; (D) Ringi Cove; (E) Noro; (F) Viru Harbour; (G) Allardyce Harbour; (H) Yandina; (I) Honiara; (J) Tulagi; (K) Aola Bay; (L) Pakera Point.

Silentworld is a freight forwarding service for the outer islands, with landing craft tankers that are able to roll on and roll off cargo at sites where there is limited port infrastructure. The barges are equipped with forklifts and cargo facilities, and service the towns of Malaita, Choiseul, Gizo, Munda, and Buin on a monthly basis.

The ADB Domestic Maritime Support (Sector) Project aims to provide access to remote outer island communities. It intends to establish eight shipping services between major centres of Solomon Islands and the islands listed below (ADB, 2013):

- outer islands of Temotu Province (operational);
- Ontong Java in the outlying region of Malaita Province (operational, although not economically sustainable);
- Sikaiana atoll in the outlying region of Malaita Province (not economically viable);
- Shortland Islands in Western Province;
- Rennell and Bellona Province (not economically viable);
- Makira Island (east of Guadalcanal) (operational);
- Weather Coast in the Guadalcanal Province; and
- Ulawa in Makira-Ulawa Province (operational).

Under the ADB project, 12 wharves and 3 landing ramps have been built, and most provincial centres—including Honiara—have jetty facilities. Kirakira, the main centre in Makira Ulawa Province, is the exception.

The Port of Honiara terminal is approximately four hectares with a main quay, 150 metres long by 12 metres deep, and a warehouse. Absent are a shore crane, a quarantine incineration facility, and private stevedore services.

The Port of Honiara is capable of handling 40,000 twenty-foot equivalent units (TEU) per year. The port has a current throughput of approximately 13,000 import, 1,800 export and the return of 11,200 empty containers each year which may potentially be made available for reverse logistic arrangements. The port also loads and unloads approximately 1,000 trans-shipment containers each year.



The Port of Honiara is serviced by multiple international shipping lines. 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.

Solomon Islands: Shipping Lines		
Swire Shipping; AUSPAC Consortium, including SOUTH PAC Service; Kyowa Shipping Co. Ltd.; NYK Line; Polynesia Line		
Destination	Schedule	Est. USD per TEU
Australia	21-day	2,200 to 4,600
Papua New Guinea	21-day	TBA
Fiji	14-day	2,920 to 3,300

Source: AMSTEC Pty Ltd

Notes: USD = U.S. dollar;

TEU = twenty-foot equivalent unit.

Solomon Islands: Island Port Facilities		
Location/Island	Province	Port Facilities
Nu'usi and Siota Islands		Wharf and landing ramp
Mbunikalo on Choiseul Island	Choiseul	Wharf and landing ramp
Katurasele		Wharf
Manikaraku		Wharf
Ringgi on Kolombangara Island (New Georgia Islands)	Western	Wharf
Keru on Keru Island, (New Georgia Islands)	Western	Wharf
Ngasini on Vangunu Island		Wharf
Susubona on Santa Isabel Island	Isabel	Wharf
Lambulambu on Vella Lavella Island	Western	Wharf
Vuranggo Point on Choiseul Island	Choiseul	Wharf
Lengana	Western	Wharf
Uhu Island	Malaita	Landing ramp

Institutional framework

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

Solomon Islands nine provincial governments were established under the Provincial Government Act 1997, allowing them to issue ordinances and policies and provide services to rural areas. These include waste collection and disposal services and shipping facilities.

Honiara City, the tenth province and only council, was established under Honiara City Act 1999. It assigns the City Council the responsibility for waste collection and disposal, street cleaning, and environmental health control. Honiara Refuse Disposal By-Law 1994 directs Honiara City Council to plan and implement solid waste management (SWM) systems, and Honiara Litter By-Law 1994 prohibits littering in public places. The Council also shares responsibility for environmental conservation and other public schemes (e.g., medical, roads) with the remaining nine provincial governments. While Local Government Act 1996 decrees that the Minister for Home Affairs establish local councils, they are yet to be so.

Since the Western Provincial Government (Gizo) is at the forefront in terms of tourism in the Solomon Islands, it is in the process of preparing protocols to ban plastic bags. These are considered now to be at an epidemic proportion.

Environmental Health Act 1980 is administered by the Environmental Health Division of the Ministry of Health and Medical Services, responsible for developing and implementing health policies in relation to solid waste. The Act prohibits the creation of health nuisances from solid waste, including the breeding of mosquitoes from refuse; dumping of refuse in urban watercourses, on beaches, and foreshores. It oversees the activities of waste service authorities, ensuring they maintain hygiene and prevent such nuisances.

The Ministry of Environment, Climate Change, Disaster Management and Meteorology administers Environment Act 1998 through its Environment and Conservation Division. The Act provides for the protection and conservation of the environment by regulating the discharge of pollutants to air, water, and land; the transport, collection, treatment, storage, and disposal of waste; and the promotion of economically viable recycling, reuse, and recovery. This legislation also gives effect to the regional and multilateral agreements and conventions listed in the table below.

Environment Regulation 2008 guides the environmental impact assessments of proposed developments and pollution control relating to the discharge of waste. The regulations were amended in 2014 to introduce sewerage and effluent discharge fees. Environment Act 1998 and this Regulation were reviewed in 2016, although further review of Section 5 (Control of Pollution) is yet to be undertaken.

The Act and Solid Waste Management Strategy 2009–2014 provide the legal and policy framework for improving SWM. Progress, however, has been slow due to a lack of financial resources, institutional capacity, and the political will to promote SWM as a priority issue, particularly in Honiara. Pollution control and the protection of human health from unregulated dumping are the responsibility of the Environmental Health Division and the Environment and Conservation Division. The fact that there are two bodies involved may be reason for the delay of much-needed improvements.

The Solomon Islands Integrated Waste Management and Pollution Control Strategy 2016-2025 has been drafted, although endorsement by cabinet is yet outstanding. National Solid Waste Management Strategy 2009 identifies the need for national policy and legislation for waste management and pollution control, as well as for sustainable financing mechanisms.

Maritime Safety Administration Act 2009 and Shipping (Marine Pollution) Regulations 2011 give effect to international conventions and relate to pollution caused by vessels. Merchant Shipping (Oil Pollution) Order 1975 and the Continental Shelf Act 2006 do likewise. Biosecurity Act 2013 provides for measures in relation to the import and export of plant and animals, and it ensures quarantine control over recyclable materials.

Solomon Islands is a party to various multilateral environmental agreements and conventions, except for the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. These are listed in the table below.

Solomon Islands	
MEA's 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 (Annexes I, II, III, IV, and V)	Ratified
London Convention on the Prevention of Marine Pollution by the Dumping of Wastes and Other Matter 1972	Ratified
International Convention on Civil Liability for Oil Pollution Damage 1969 (renewed 1992)	Ratified
Noumea Convention:	Ratified
Protocol on Dumping	Ratified
Protocol on Combatting Pollution Emergencies	Ratified

SPREP, 2016

Financial mechanisms

Currency: Solomon Islands dollar (SI\$)

Honiara City Council has no specific budget for SWM, although it does receive from the government at the national level special and unconditional grants for key services. These amounted to approximately US\$1.7 million in 2011. The grants accounted for approximately 30% of total council revenue, with US\$29,000 having been allocated in 2012 for contractors of waste collection.

There are no user-pays fees for waste collection or disposal services in Honiara. A property tax, based on land and building values, is applied, although only approximately 25% is collected.

Honiara City Council provides user-pays waste collection services to market vendors and commercial businesses at a rate of US\$3.70 per drum (US\$3 for each additional drum). The collection fee for larger, 2 cubic metre, bins is US\$185 and for 3 cubic metre bins, approximately US\$300. Collection of uncontained ground waste is charged at US\$88. These fees offset the cost of residential collection services. The low collection rate of property tax and the large number of informal settlements that do not pay council fees are key issues that need addressing in terms of SWM improvement in Honiara.

The nine provincial governments also receive funding from the national government for operational and capital development. Financial support is provided by the Provincial Capacity Development Fund, Rural Development Program, Rural Advancement Micro-Projects Program, and Rural Constituency Livelihood Fund.

Approximately 66% of the provincial budget is allocated to operations, administration and wage expenditures. The remainder applies to capital development projects.

Conclusions

While National Integrated Waste Management and Pollution Control Strategy 2016-2025 awaits government endorsement, its predecessor, National Solid Waste Management Strategy 2009, identifies the need for specific legislative regulations for various financial mechanisms. These include user-pays/polluter-pays schemes and a CDS. Such mechanisms will support the longer-term sustainability of waste management systems in the Solomon Islands.

Increased efforts to provide regular shipping services to the outer islands of Solomon Islands should be made. These will enable communities to participate in a CDS, as well as potential future extended producer responsibility (EPR) strategies.

Solomon Islands has not ratified the Basel Convention, therefore movements of hazardous waste to recycling markets or treatment facilities is limited to destinations within the Waigani Convention region.

While the port of Honiara is located on a reasonably cost-efficient and regularly serviced route, it also has the capacity to handle increased cargo volume. Its port infrastructure, however, is relatively standard and requires upgrading.



Abbreviations

ADB	Asian Development Bank	MARPOL	International Convention on the Prevention of Pollution from Ships
CDS	container deposit scheme	MEA	Multilateral environmental agreement
DOEE	Department of Environment and Energy (Australia)	MFAT	Ministry of Foreign Affairs and Trade (New Zealand)
EOL	End of life	OEC	Observatory of Economic Complexity
FY	Financial Year	PET	polyethylene terephthalate
GoSI	Government of Solomon Islands	PV	Photovoltaic
HDPE	high-density polyethylene	PRIF	Pacific Region Infrastructure Facility
HNS	Hazardous and noxious substances	RTRC	Regional Tourism Resource Centre
ICSHP	International Centre on Small Hydro Power	SPREP	Secretariat of the Pacific Regional Environment Programme
J-PRISM	Promotion of Regional Initiative Solid Waste Management	SWM	Solid waste management
JICA	Japan International Cooperation Agency	T	tonne
kg	kilogram	TEU	twenty-foot equivalent unit
km	kilometre	UAE	United Arab Emirates
km ²	square kilometres	UNIDO	United Nations Industrial Development Organization



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