



Centre for Environment
Fisheries & Aquaculture
Science



Solomon Islands – Best Practice Waste Management report

**Overview and outcomes of the Best Practice Actions –
November 2018-February 2019**

Author(s): Amy Foxe, Tony Khoury, Amardeep Wander, Anne Prince

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Project Manager:	Julia Baker (Project Manager), Thomas Maes (Principal Investigator)
Report compiled by:	Asia Pacific Waste Consultants (APWC)
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Executive Summary

The Commonwealth Litter Programme (CLiP) is an initiative delivered by the Centre for Environment, Fisheries and Aquaculture Science (Cefas) and funded by the United Kingdom's Department for Environment, Food and Rural Affairs. The initiative supports developing countries across the Commonwealth in advancing national litter action plans focused on preventing litter, including plastics, entering the oceans.

In 2018, CLiP contracted Asia Pacific Waste Consultants (APWC) to study waste management practices in Solomon Islands and offer best-practice solutions and training to staff who are engaged in the design and delivery of waste services.

Over the course of data collection in November 2018, best practice demonstrations were undertaken in all communities and islands visited to provide residents with ideas on source separation and waste disposal that could be undertaken locally without extensive external intervention. This report presents some of the best practice actions and demonstrations undertaken in various communities across Solomon Islands.

A number of problem waste streams were identified during the waste audit process carried out in 2018. In response, APWC developed a programme to share knowledge and ideas relevant to the Pacific context. One objective was to build collaborative relationships by sharing solutions and lessons learned in the Australian context to help tackle marine litter and broader waste issues.

This report presents the Best Practice Showcase delivered to delegates from Solomon Islands, Vanuatu and co-operative organisations with a presence in the South Pacific, from 4–6 February 2019 in Sydney, Australia.

Over the course of three days, a number of presentations and site visits were conducted to provide Australian context and candid discussion on a range of waste management areas of interest, including contract structures and contract management, optimised waste fleets and their management, container deposit schemes (CDS), extended producer responsibility schemes (EPS), education and engagement.

Evaluation of the showcase identified a high level of delegate satisfaction with the programme. All delegate responses were positive. Respondents felt there was a high degree of relevance and professional growth arising from their participation.

These seminars provide a strong foundation for tailored in-country training to be delivered in March 2019. Due to the showcase, the in-country training can now better reflect the specific and unique needs of Solomon Islands waste management challenge.

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Acronyms

ACRONYMS	
ADB	Asia Development Bank
APWC	Asia Pacific Waste Consultants
CCOA	Commonwealth Clean Oceans Alliance
CDL	Container deposit legislation
CDS	Container deposit scheme
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CLiP	Commonwealth Litter Programme
CHOGM	Commonwealth Heads of Government Meeting
Defra	The UK Department for Environment, Food and Rural Affairs
ED	Environment Division of Department of Environment
EHD	Environmental Health Division of Honiara City Council
EHO	Environment Health Officer
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EU	European Union
FFA/SPC	Pacific Islands Forum Fisheries Agency
GEF	Global Environment Facility
GIS	Geographic information system
GMP-POPs II	Global Monitoring Plan on Persistent Organic Pollutant Phase II
GPS	Global Positioning System
HCC	Honiara City Council
HDPE	High-density polyethylene
IMO	International Maritime Organisation
IUCN	International Union for the Conservation of Nature
JICA	Japanese International Co-operation Agency
J-PRISM	Japanese Technical Co-operation Project for Promotion of Regional Initiative on Solid Waste Management
J-PRISM II	Japanese Technical Co-operation Project for Promotion of Regional Initiative on Solid Waste Management in Pacific Island Countries Phase II
kg	Kilogram
LEAF	Earning and Ecological Activities Foundation for Children (LEAF) Project
LDN	Least developed nation
LDPE	Low-density polyethylene
LGA	Local Government Act
LGNZ	Local Government New Zealand
MARPOL 73/78	The International Convention for the Prevention of Pollution from Ships (Marine Pollution), 1973 as modified by the Protocol of 1978
MEA	Multi-lateral environmental agreements
MECDM	Ministry of Environment, Climate Change, Disaster Management and Meteorology

MID	Ministry of Industry and Development
MGB	Mobile garbage bin
MHMS	Ministry of Health and Medical Services
MSW	Municipal solid waste
NAPA	National Adaptation Programme of Action
NCCP	National Climate Change Policy
NDS	National Development Strategy
NGO	Non-government organisation
NZ	New Zealand
NZMFAT	New Zealand Ministry of Foreign Affairs and Trade
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
PICS	Pacific Island countries
PRIF	Pacific Region Infrastructure Facility
PV	Photo voltaic
SAMOA	SIDS Accelerated Modalities of Action Pathway
SBD	Solomon Islands Dollar
SI	Solomon Islands
SID	Small island developing states
SIMSA	Solomon Islands Maritime Safety Administration
SIPA	Solomon Islands Ports Authority
SIWA	Solomon Islands Water Authority
SPC	Secretariat of Pacific Country
SPREP	Secretariat of the Pacific Regional Environment Programme
SWM	Solid waste management
TCPA	Town and Country Planning Act
UNEP	United Nations Environment Program
UNICEF	United Nations International Children's Emergency Fund
USD	United States dollars
VHF	Very high frequency
WHO	World Health Organization
WMAA	Waste Management Association of Australia
WMPC	Waste Management and Pollution Control
WPA	Western Provincial Authority
WRIA	Waste Recycling Industry Association
WtE	Waste to energy

1 Introduction

1.1 Project need

Capacity building within Pacific Island communities (PICs) is a key priority to help deal with the growing problem of waste management and the prevention of land- and marine-based litter. The implications of pollution on marine ecosystems have been widely studied, however the impact on human health remains poorly characterised. Human health impacts are perceived to be an emerging problem requiring increased scrutiny and attention (Seltenrich, 2015; Ocean Conservancy and International Coastal Cleanup, 2014). There is increasing urgency among industry, government, non-governmental organisations and environmental groups to develop tools and policies to track, capture and recycle waste (particularly plastics) before it reaches the oceans.

PICs face unique and significant obstacles in the development and implementation of sustainable waste management solutions to address and combat litter in terrestrial and marine environments. Organic waste, waste oils and waste from shipping and cruise liners also produce a unique challenge for the area. Globalisation, including increased affluence and consumer-based lifestyles with a heavy reliance on imported goods, has had a substantial impact on the amount of waste generated within communities. The waste challenges for island communities are considerable, due in large part to geographic location and physical size coupled with lack of suitable land availability for waste management solutions such as transfer stations, waste treatment and disposal sites, and recycling and reuse facilities. Other obstacles, including the topography and location of some communities, as well as resourcing and infrastructure limitations, means that many communities, especially those in remote locations, have limited or no access to sustainable waste management. As a result, waste is often dumped, burned or buried, leaving it susceptible to dispersal into the environment.

Transboundary marine litter is another issue facing PICs, with many livelihoods dependent on the continuing health of the ocean. Creating a balance between satisfying the economic aspirations of increasing populations while maintaining healthy marine and terrestrial environments is of major importance in reducing risks to human health, as well as the land- and marine-based life. Major waterways are capable of transporting a substantial amount of waste and litter. Up to 90 per cent of marine litter consists of plastics originating from both land- and sea-based sources (UNEP and GRID-Arendal, 2016). Plastic debris from the land comes primarily from two sources: first, ordinary litter; and second, waste disposed of at open dumps, landfills or illegally dumped waste which then becomes airborne or washes into the ocean from inland waterways and wastewater outflows (Jambeck, J.R. et al., 2015). Marine sources of plastic debris are more nuanced but arise from shipping activities related to transport of goods, services, tourism and fishing.

It is estimated that in the Asia–Pacific region the cost of marine litter to marine industries is a minimum of €1.26 billion per year, including losses from tourism, entangled ship propellers and time lost for fishing (McIlgorm, A., et al., 2008). In the EU, it has been suggested that the cost for coastal and beach cleaning is about €630 million annually (Acoleyen, M., et al., 2013; Werner, S., et al., 2016).

Preventing pollution, especially plastics from entering the environment, requires focused efforts on behaviour change (for example, reducing reliance on single-use plastics), improvements in waste

management and developing a more sustainable life cycle for wastes such plastics. The steps to improve poor systems of waste management or mismanagement of waste rely on quantifying the scale of the problem and the sources of plastics leakage and other wastes into the system. To date, this quantification has not happened. Gaps in local capacity, as well as details of infrastructure and management systems, must be quantified and linked to the leaked waste in order to adequately deal with the issues.

1.2 The Commonwealth Litter Programme (CLiP)

The Commonwealth Litter Programme (CLiP) will support developing countries across the Commonwealth to advance national litter action plans, focusing on preventing litter (including plastics) entering the oceans. The programme is starting in the South Pacific Region, working with Vanuatu and Solomon Islands, and this project forms a part of the programme.

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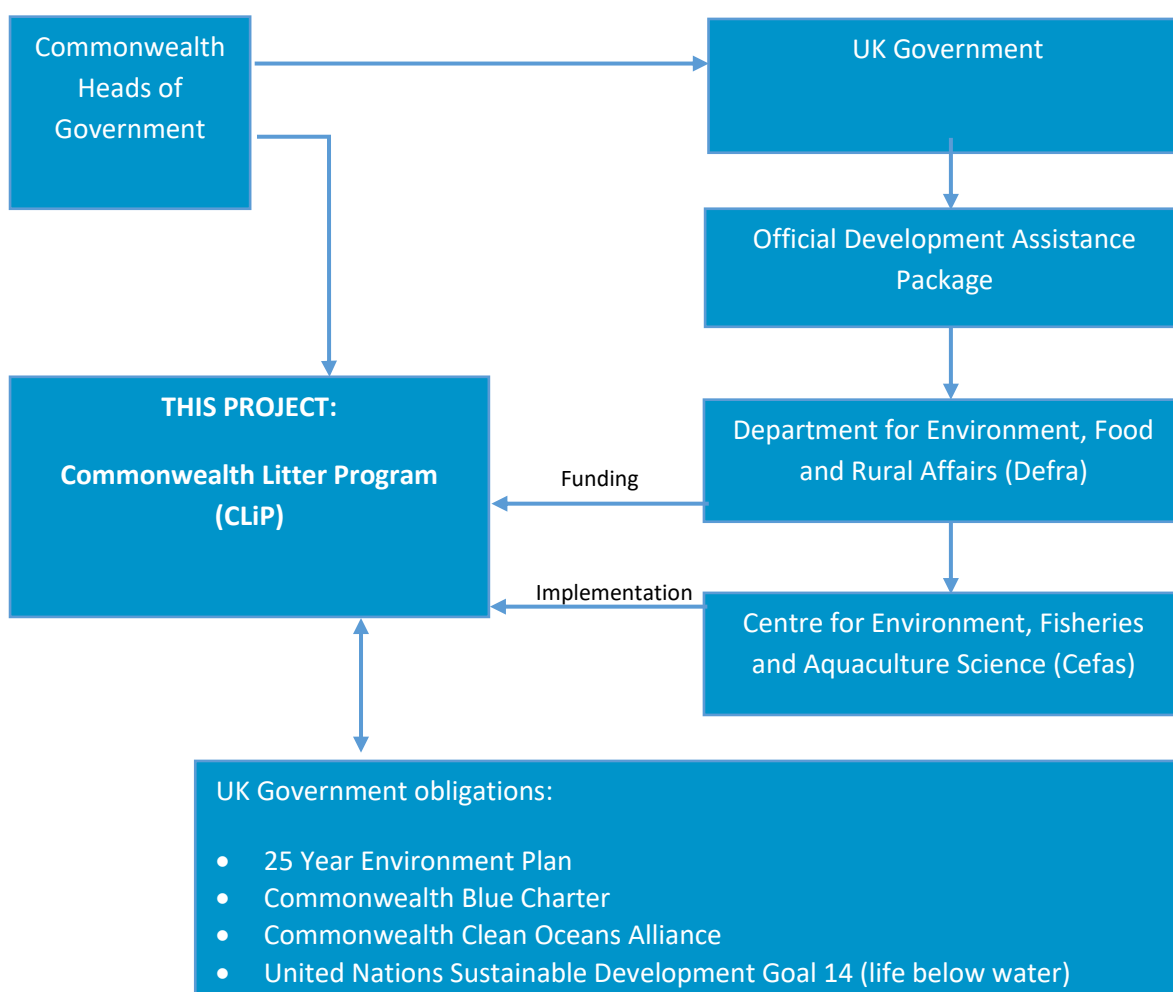


Figure 1: Project delivery organisations

Funded by the Department for Environment, Food and Rural Affairs (Defra), CLiP is led by the United Kingdom through the Centre for Environment, Fisheries and Aquaculture Science (Cefas). Cefas is the UK's largest applied marine science organisation, shaping and implementing policies through scientific and collaborative relationships that span the EU, UK government, non-governmental organisations, research centres and industry.

The programme contributes to the UK meeting its responsibilities under the Commonwealth Blue Charter, which calls for Commonwealth countries to drive action and share expertise on issues affecting the world's oceans, including marine litter. CLiP will contribute delivering the objectives under the UK- and Vanuatu-led Commonwealth Clean Oceans Alliance (CCOA), which calls on other countries to pledge action on plastics to eliminate avoidable plastic waste. CCOA also promotes actions in line with the United Nations Sustainable Development Goal 14 (life below water) to conserve and sustainably use the oceans.

1.3 This report

Asia Pacific Waste Consultants (APWC) has been engaged by the Centre for Environment, Fisheries and Aquaculture Science (Cefas) to study waste management practices in Solomon Islands, and offer best-practice solutions and training to staff who are engaged in the design and delivery of waste services in the country (including provinces). This is a deliverable under CLiP.

The delivery pathways for the project are listed in Figure 2.

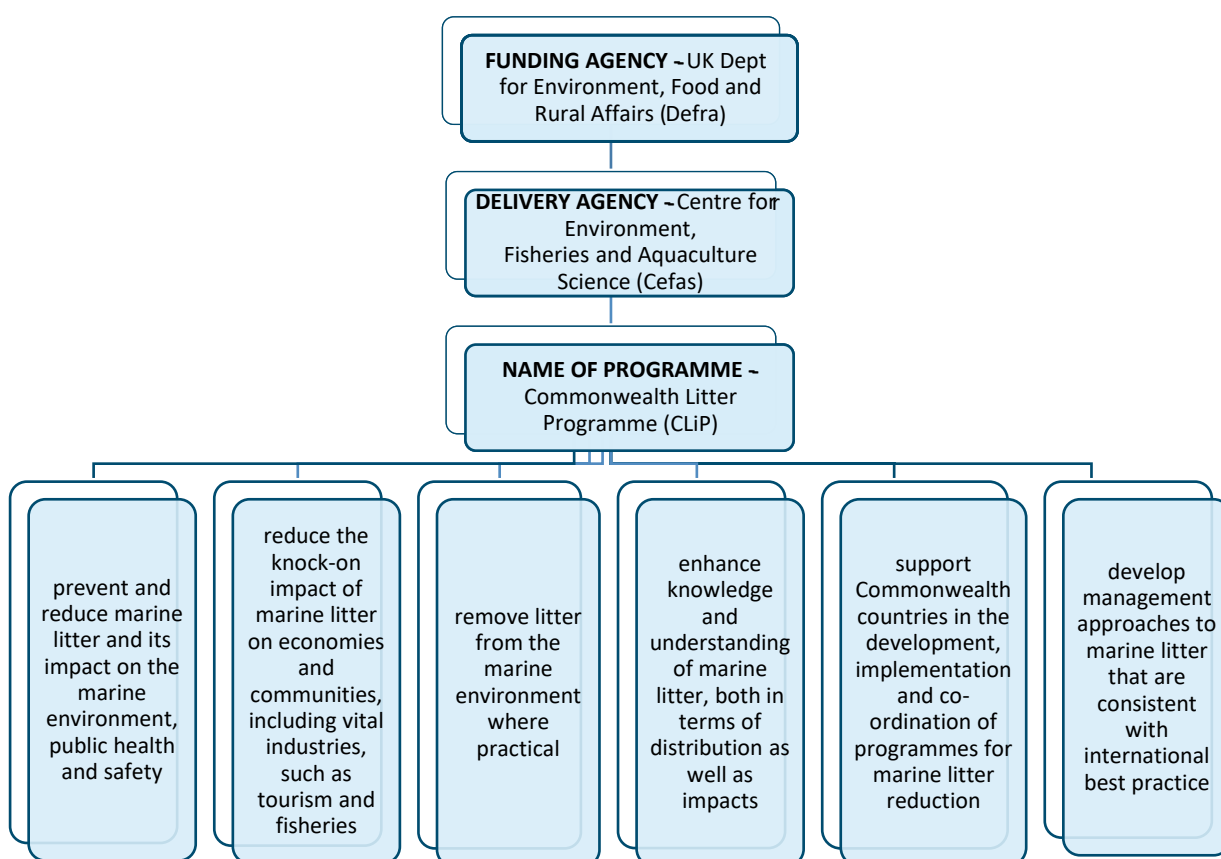


Figure 2: CLiP sponsors and objectives

APWC deliverables have three focus areas, listed below:

- Data collection on waste collection and disposal services, and disposal behaviour
- Best-practice solutions to the current situation
- Provision of training for in-country staff.

This report presents the results of the work undertaken for the second focus area i.e. best practice solutions, however, should be read in conjunction with the Waste data report, the Port Waste Reception Facilities report and the training report for Solomon Islands.

The report starts with a recap of the key findings of the Waste Data report, the gaps identified in services and infrastructure and recommendations for best-practice approaches. The next section presents the work undertaken in November 2018 and best practice case studies. An overview of the Best Practice Showcase follows, with the design of the showcase responding to the gaps. The final section of the report provides the delegate evaluation of the showcase to inform any future events, along with the lessons learned by APWC through the organisation and delivery of the showcase

2 Recap: Waste data and service gaps

Waste data collection work was undertaken in late November through to early December 2018. The APWC team was in Solomon Islands for two and a half weeks and assessed waste from eight communities. In total, 218 household waste samples were collected, with 178 rural and 40 urban samples collected from eight different communities. The rural samples were divided between two localities, with 81 samples collected from five villages along Lunga river and the remaining 93 samples collected from three communities in Malaita province. In addition to the household samples, 46 commercial samples were assessed – 31 premises in Honiara and 15 premises in Auki (Malaita).



Figure 3: Honiara sampling distribution

Note: Blue dots represent urban communities, yellow dots represent commercial samples and green represent rural Guadalcanal communities



Figure 4: Communities assessed in Malaita province

Interviews were conducted with all households where waste was collected in order to cross-reference socio-economic and waste behaviour data with the waste disposed. APWC was able to draw upon previous work completed by JICA analysing waste generation. JICA studies are estimating the total

amount of waste generated at source rather than the amount people are willing to place in a bag. The comparison of the two studies shows that although the waste collection systems are in place, there is a real need for a number of matters to be urgently addressed to prevent disposal of waste into the environment via waterways, burning and burying.

In summary, the key outcomes of the waste disposal research and analysis are:

- The amount of waste generated between urban and rural areas differed;
- A correlation between waste generation and the average grocery bill for an area was identified, however this did not translate down to the household level;
- Less than half of the waste generated in urban areas is being captured through waste management systems currently in place;
- All waste generated in rural areas is being disposed of through burning, burying and dumping, either on land or in nearby waterways;
- Nappies are a particular problem, with dumping in waterways occurring in urban areas due to the lack of adjoining land to bury the waste;
- Existing programmes that support reuse of household organic waste within gardens are resulting in beneficial reuse rather than disposal of this waste stream.

Based on the disposal data, APWC draws the following conclusions:

- Burning is the most common way of disposing of waste in areas that are without collection systems.
- Although the collections in Honiara are unreliable and do not cover the entire city, there is a significant change in disposal behavior in comparison to localities without a system in place i.e. the rate of disposal of waste is higher, the types of wastes that are considered disposable also differ and almost no traditional organic composting is undertaken. This is explored in detail in the waste data report.
- The provision of a collection service would be a good first step for areas beyond Honiara. In Honiara, the collection service needs to improve in terms of regularity and consistency.

Figure 5 lists the top ten individual items disposed of in Solomon Islands and the proposed best-practice actions to manage these items.

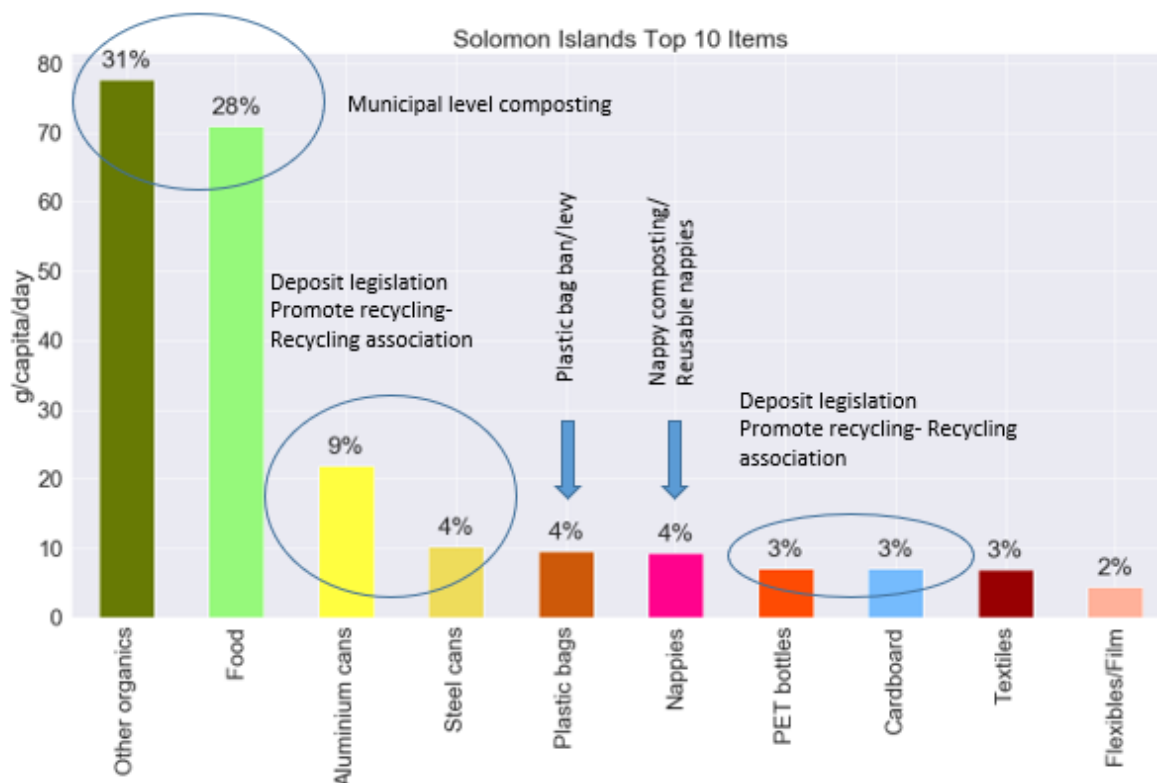


Figure 5 Solomon Islands – top 10 waste items and proposed solutions

Best-practice actions are proposed based on both qualitative and quantitative data included in the Waste Data report. Given the desperate need for Solomon Islands provinces and Honiara to extend or find land for landfilling, separation of organics and composting seems the obvious first step to recoup some more space in the landfills that are nearing capacity.

Commercial sources had comparatively more paper and e-waste and less hygiene and metal waste than household sources. Both had similar quantities of organic waste. Somewhat expectedly, retail trade and administrative services produce a much larger amount of paper and cardboard waste as compared to accommodation and restaurants. All types of commercial premises produced large quantities of recyclable plastic and metal whereas administration offices generated a substantial quantity of e-waste.

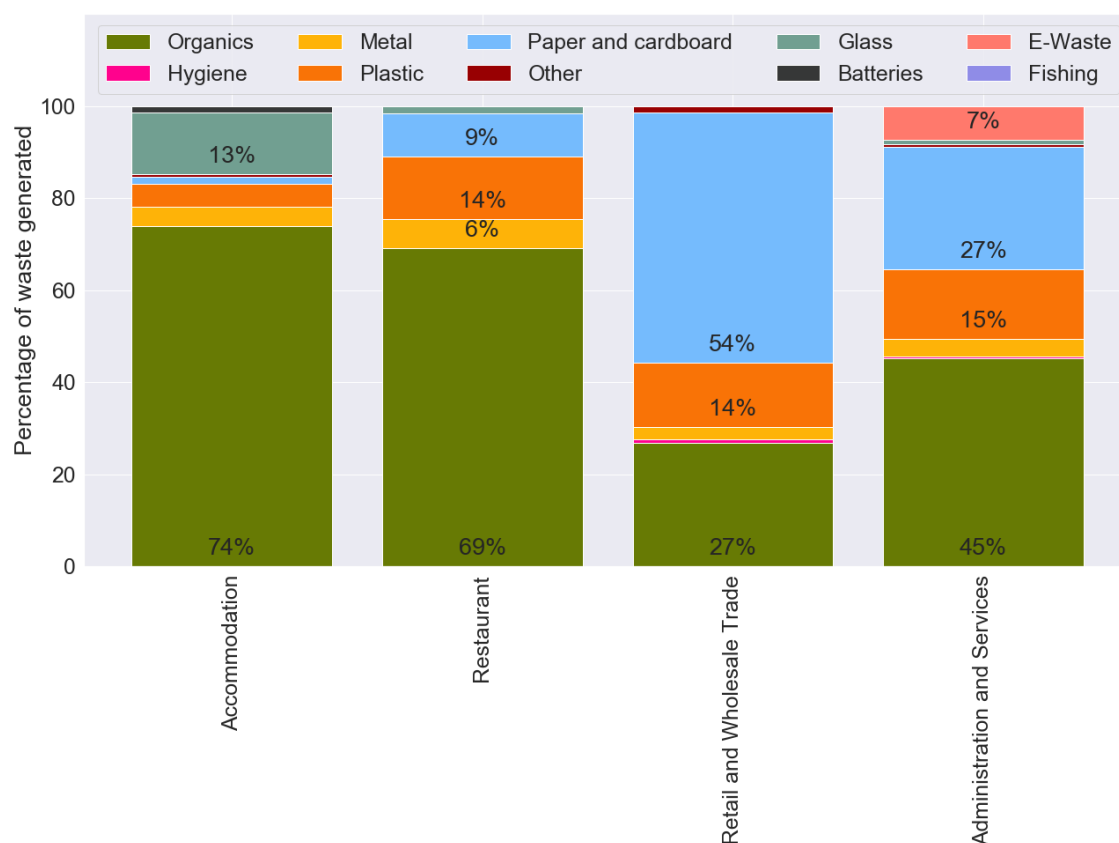


Figure 6: Solomon Islands waste composition by business type

The best-practice actions proposed below also include the wastes generated in commercial premises. Town councils and provincial governments might be able to exercise a greater degree of control over commercial premises through licence conditions. This could lend itself to quicker reform for the sector as compared to household waste.

2.1 Service gaps

The following gaps have been identified in the provision of waste management services in Solomon Islands.

Table 1: Gaps in overall waste management in Solomon Islands

Theme	Gaps
Policy/legislation	<ul style="list-style-type: none"> There is confusion as to where ultimate responsibility for waste management lies. Although the environment health officers (EHO) are responsible for delivery and implementation of waste management projects in Honiara and around the country, the Ministry of Environment has taken the lead in developing a national solid waste management plan (NSWMP). Although the Ministry of Environment developed the NSWMP, no resources have been allocated to the implementation of the plan. The plan also does

Theme	Gaps
	<p>not identify how it will use the Ministry of Health resources to implement the actions. The plan also lacks tangible targets or goals.</p> <ul style="list-style-type: none"> • There are no current solid waste management plans at the provincial or local level for the country. • The only ordinance empowering HCC to implement waste management is the litter ordinance with its 7-metre rule (HCC litter ordinance). • There is no law making it compulsory for HCC to collect a payment for dumping material at the dump site. • There are no robust financial mechanisms that allow for HCC or provincial governments to fund their waste management activities.
Data collection and decision making	<ul style="list-style-type: none"> • All waste data i.e. household waste collection, disposal and littering data is collected with the help of JICA volunteers funded through the JPRISM program. • There is no internal capacity within local councils or provincial staff to use data for decision-making processes i.e. when data is made available to staff they are not able to use it to make evidence based decisions. In some cases this is due to a lack of skills and in other cases it is due to the lack of time. • No litter data collection is undertaken in a systematic process to understand, what, why and where. • Data for incoming waste is not collected at the Ranadi dump site. • Landfills do not charge a fee for dumping. • Most provinces don't have landfills or even managed dumping spaces. • Most islands don't have any waste disposal facilities or any accounting for what is happening with their waste.
Economic instruments	<ul style="list-style-type: none"> • There is no income from waste management activities currently coming into HCC or any other province. • The business houses (i.e. commercial premises) are charged a small levy. • All income/expenditure for waste management is not clearly accounted for. • The budget for solid waste management is limited. • Although provinces are thinking about having financial mechanisms in place, it is not currently the case. • None of the landfills/dumps charge a fee for disposal. • There are no financial incentives in place in the form of export tax breaks for recycling activities and shipping of recyclable materials overseas.
Collection services	<ul style="list-style-type: none"> • Domestic collection services are provided by HCC only. • The collection services in HCC are also limited to the urban areas only but an expanding population and expansion to the peri-urban areas will require services and substantial support. • The services in provinces are ad hoc and basic.
Equipment and maintenance	<ul style="list-style-type: none"> • Collection vehicle breakdown time due to lack of spare parts is a significant issue. • There is limited stock of spare parts. • Maintenance and mechanical capacity is limited. • There were broken-down collection trucks in each of the municipal councils visited.

Theme	Gaps
	<ul style="list-style-type: none"> HCC needs more collection trucks with access to spare parts. Limited capacity exists within council to fix trucks if spare parts are made available.
Contracts and tenders	<ul style="list-style-type: none"> Private contractors are being used by HCC in some areas and this option should be explored further by HCC and provincial governments. Tender and contract management capacity is limited in the assessed council and the provincial governments.
Landfill design and management	<ul style="list-style-type: none"> Current landfill capacity is extremely limited for Ranadi. There is an urgent need to find an alternative suitable landfill site. None of the dumping sites in the provincial areas are controlled, sanitary or safe. No landfill cover was seen on any of the dump sites visited. Heavy equipment for compaction is not available or is very limited. HCC and provincial governments are dependent on hired heavy plant and equipment to manage landfill, which also has a propensity to break down. All landfills have waste pickers of all ages and genders working in very unsanitary conditions. At landfills, waste picker activity is not regulated or formalised.
Education and engagement	<ul style="list-style-type: none"> There is one awareness activity being undertaken by both HCC and provincial government aimed at educating youth about the 3Rs. Waste education/awareness is missing/limited in provinces and outer islands. There is no co-ordination between the multitude of national and international projects being undertaken in the waste space. There is no staff capacity within either the Department of Environment nor within council to undertake this co-ordination. There are no staff currently undertaking nor responsible for waste education or awareness activities.
Recycling	<ul style="list-style-type: none"> Recycling of aluminium cans is currently taking place in the Guadalcanal province. This can be strengthened through a CDS scheme or similar with a proper economic incentive. Currently \$2–3 SBD per kilogram is insufficient to motivate the broader community. Organics are not being composted or even source separated at a large scale. Market waste is currently going to the landfill at HCC. This is not the case in Auki. There is some education for source separation and composting, most of which is well practised where implemented. There is a large number of communities that have received no education or awareness. Recycling capacity in Solomon Islands is limited by the lack of awareness of markets for sale of recyclables, prohibitive shipping costs and lack of availability of simple, bespoke recycling infrastructure.
Monitoring	<ul style="list-style-type: none"> There is no monitoring and evaluation being undertaken for the NWMPCS or for the local solid waste management plans. There is no internal capacity within either the department, councils or provincial government to do so.

2.2 Training and knowledge gap analysis

APWC team spent two and a half weeks in Solomon Islands to understand the current capacity of staff implementing waste management initiatives in both Guadalcanal and Malaita province. Engagement was also undertaken with local authorities in the Western Province through the Port Waste Facilities project.

Figure 7 lists and categorises the stakeholders that were consulted to understand the current capacity gaps and to determine the training needs to improve waste management in Solomon Islands.

National & international agencies	Municipal council	NGOs and community groups	Provincial Government, islands & contractors
<ul style="list-style-type: none"> •Department of Environment (PS and Staff) •JICA (JPRISM II) 	<ul style="list-style-type: none"> •Town Clark - HCC •Environmental Health Officer •HCC Works Manager •HCC Landfill Manager •HCC Health Officers •HCC Director of Communications 	<ul style="list-style-type: none"> •BJS Recycling •Bevan - President of Recycling Association •Small scale battery recycler •Lindsey Teobasi - Plastic recycler •David Nunn- Proponent of future WtE plant 	<ul style="list-style-type: none"> •Chief Health Officer - Malaita Province •Director of Health Malaita Province •Chief Accountant - Malaita Province •Paramount Chiefs - five communities in Guadalcanal and three in Malaita •Market Manager Auki

Figure 7: Stakeholders consulted in Solomon Islands regarding training needs

Each stakeholder was consulted on their current workload, capacity to deliver services, their previous training history, their history with the organisation as well as their understanding of the gaps in their training and capacity. Nine major themes emerged, which are presented below. The gaps presented below pertain to the stakeholders mentioned for each theme.

Theme	Gaps Identified
1. Basic data collection and management skills (government officials, contractors and community groups)	<ul style="list-style-type: none"> • Data collection on household waste generation and litter • Data collection from landfills and dumpsites • Understand trends in waste data • Use data collected for decision making
2. Design and implementation of waste collection systems (government officials)	<ul style="list-style-type: none"> • The option of setting up in-house vs contracted out model of waste collection • How to monitor effectiveness of collection systems if in-house or contracted out
3. Design and implementation of economic instruments (government officials, contractors)	<ul style="list-style-type: none"> • How to design and implement any or all of the following (include policy, by-law and legislation): • User-pays system (post-use fee collection) • Pre-paid bag system • Green fees • Bans
4. Equipment and maintenance (government officials, contractors)	<ul style="list-style-type: none"> • Acquisition of vehicles that can be used and maintained in the long term • Collection vehicle maintenance and stock management of spare parts. • Landfill heavy equipment maintenance and stock management of spare parts
5. Contracts and tenders (government officials)	<ul style="list-style-type: none"> • Design of tender processes and evaluation • Design of contracts for pre-paid bag systems, CDL, collection contracts, contracts for hire of equipment
6. Landfill design and management (government officials)	<ul style="list-style-type: none"> • Determine the next stage of landfill design or management for each country • Help staff be ready for the next stages
7. Education and engagement (government officials/NGOs)	<ul style="list-style-type: none"> • Use case studies to help staff, community groups learn about best practice for engagement
8. Waste management strategy and monitoring (government officials/NGOs)	<ul style="list-style-type: none"> • Waste strategy development and development of a monitoring framework
9. Recycling (government officials and contractors)	<ul style="list-style-type: none"> • Help recyclers find the best market for their products • Train government officials in Extended Producer Responsibility (EPR) projects like CDS

Figure 8: Training gaps identified as a result of stakeholder consultation

3 Stage 1 – Local solutions

3.1 Issues identified

As part of APWC's scoping visit, several remote communities were visited. These include:

- Five rural communities on the Lunga river in Guadalcanal
- Three rural communities in the island of Malaita

In most remote communities, there is no collection service and with the municipalities struggling to get their collection services right in the short term, the team was not able to provide a solution in the form of a collection service. Therefore, short term local solutions were provided to the communities.

Based on initial observations, the problem priority wastes to be managed in Solomon Island communities are:

- Organics (largely in urban communities where no composting is taking place, currently being buried or burnt)
- Nappies (currently being buried or thrown into the ocean and streams)
- Plastics (both PET and soft plastics) (currently being burnt/thrown into waterways)
- Tin cans (aluminium and steel) (currently being burnt/thrown into waterways)

In all Solomon Island communities, the issues around best practice arise from the following:

- There are no existing landfill sites for appropriate disposal of waste.
- Ranadi Dump Site in Honiara is running out of space and a new block hasn't been found
- None of the smaller towns visited had appropriate dumpsites and all are in the process of looking for landfill space.

In Solomon Islands, one of the major observations was the popularity of "sup sup gardens" (organic gardens) and the composting of organic waste at the household level.

All communities visited were practicing the sup sup garden technique for their organic wastes. APWC decided to recommend the digging of small landfill behind their homes to each of the communities visited. The communities were highly sceptical of practicing waste management techniques as there has been little or no follow-up amongst the communities on issues relating to waste management.

The following communities were contacted and awareness raised through education:

1. Lungga river community
2. Yellow Bamboo community
3. Arabella community
4. Ambu community



Image 1: Organic waste being used for mulching around banana plants as demonstrated by APWC staff



Image 2: Faafetai, from APWC, engaging with the Lungga river community on source separation



Image 3: Yellow bamboo community along Lungga River- Faafetai's source separation talk



Image 4: One on one conversations with the chief from Kilusikawalo



Image 5: One on one conversations with the chief Mr Brown from Arabella

In Solomon Islands, APWC decided to focus on policy and planning, rather than community based best practice solutions as a result of the gap analysis provided above. The council and provincial governments need to have structures in place to ensure that the community can then be engaged to participate in the waste management process. All levels of government require support to ensure land is secured for future landfills. We note that some of the best practice solutions being offered cannot be implemented without action on landfill space. The following five best practice actions were undertaken as part of this project in Solomon Islands.



Image 6: HCC staff undertaking household interviews under direction

- 1) Pre-paid bag system: During the Australia section of the best practice tour, the APWC team in collaboration with the staff from Vanuatu hosted a session on the introduction of the pre-paid bag system for collection. The system had teething issues in Vanuatu, and therefore there is potential for the counterparts in Solomon Islands to learn from the experiences of Vanuatu.

APWC will ensure that all related documentation and ordinances are shared with Solomon Islands staff and that a trial introduction of pre-paid bags in Solomon Islands will be

encouraged. We believe that the pre-paid bag model with a centralised collection point has the potential to be successful not only in Honiara but also in the provinces.

- 2) Financial mechanisms: The delivery of best practice training session in Sydney also included a session on the introduction of plastic bag bans with the models from Vanuatu and Samoa discussed with the participants. The related legislation and required paperwork were also provided to participants.
- 3) Composting: The best practice tour in Sydney included a demonstration of simple, low tech composting techniques including community scale composting bins that can be built using local materials. The Best Practice tour focussed heavily on small scale community composting solutions.
- 4) Waste and Recycling Association: It became apparent during the stakeholder consultation as well as the consultation with the association that in order for the association to flourish, it needs ongoing support. It is therefore envisaged that during the best practice tour, an MOU was discussed between the Australian Waste and Recycling contractors Association to provide ongoing guidance and support to the Solomon Islands Association. Due to the fact that a number of delegates could not attend, this MOU is still being progressed and will be reported upon when available. Support has been made available through the existing J-PRISM II project to support the recyclers from Solomon Islands to go to the next 3R forum in Bali and make connections with future markets.
- 5) Other: The best practice tour and training sessions also focussed on the following areas:
 - a. Contract management and tenders
 - b. Equipment
 - c. Container Deposit Scheme

4 Suggested best-practice actions

4.1 Improved policy/plan structure and delineation of roles and financial mechanisms

Solomon Islands has a national waste management strategy that sits within the Department of Environment. The strategy clearly states the issues that require attention around waste management and offers several possible solutions. However, the strategy can be strengthened through the addition of an outcomes-based action plan. The action plan should include the following:

- Clear targets that need to be achieved based on the problem priority materials of concern
- Articulated actions that will help achieve each target
- List of the resourcing requirements for each action
- Defined roles within each stakeholder organisation responsible for ensuring these goals or targets can be achieved
- Defined roles within each stakeholder organisation responsible for collecting data and measuring progress against each goal
- Define a clear monitoring and evaluation matrix for each activity identified in the action plan
- Help each province write a waste management action plan with all activities clearly contributing to the achievement of the targets mentioned in the national waste management strategy.
- All town councils and provinces need to establish financial mechanisms that would allow them to fund their collection and disposal activities in a sustainable manner. This includes prepaid bag systems, container deposit legislation, environmental levies, fees for disposal at landfills as well as a separate accounting system for money collected for waste management.

4.2 Management of organics

Any future policy or plan for Solomon Islands, even in provinces and regional Guadalcanal, must consider a proposal to manage organic waste. With landfill space running out or non-existent, the removal of organics from the incoming waste stream to landfill not only solves an environmental issue, it has the potential to reduce the requirement for landfill space and therefore a substantial cost to government and HCC. The following table outlines the potential landfill savings in HCC only, based on the data collected by APWC in 2018 and using the J-PRISM II incoming waste to landfill survey of 2017.

Table 2: Potential savings in landfill space based on source separation of organics

Source of waste	Daily tonnes to landfill	Potential recovery modelled*	Potential tonnages diverted from landfill (yearly)	Potential landfill space saved (m ³ per year)
Household	47% of 32.8	60%	2,886	4,645
Commercial	45% of 39.8	80%	4,470	7,195
Markets	7.9	90%	2,218	3,571
Total	41.226	2.3	9,574	15,411

* Note: Potential recovery means the ability to source separate and recover material if a system was put in place

Based on a 47% organic content in Honiara's household waste and a 60% recovery rate, composting would lead to a saving of 4,886 tonnes of organics going to landfill, saving 4,645 cubic metres of space¹. J-PRISM data (2017 HCC waste management strategy) shows that 7.9 tonnes of market waste enters the landfill each day, of which 93% is organic in nature and 7% is contamination. Assuming 90% of this waste is able to be segregated for composting, it would save an additional 3,600 cubic metres of space in the landfill. Similarly, commercial waste contributes about 7,195 cubic metres of organic waste per year.

Overall, a minimum of 15,000 cubic metres of space per year can be saved at the Ranadi dump site if organics can be separated and composted separately in Honiara.

With a large amount of organic waste being generated, a study will have to be performed to ensure that any organic product generated as a result can be sold back to the community.

However, any future business plan should consider the segregation of organic matter, composting it and using it as landfill cover. None of the landfill sites visited during the APWC visit were using a landfill cover. Using a volume-reduced and composted organic product reduces the need for landfill space, reduces greenhouse gas emission and methane production and improves landfill management through the availability of cover material.

APWC understands that acquisition of land is a challenge. Land needs to be acquired, however, even for a composting trial, as there is not enough available land at the Ranadi dump site.

4.3 Container deposit legislation and support for recycling association

Container deposit schemes (CDS) encourage community recycling while reducing litter and the number of containers going to landfill. Under such schemes, eligible empty containers can be returned at return points for a refund. The best schemes have different refund amounts for different containers or materials depending on the value of the recyclable material.

A small CDS is currently in place in Honiara for beer and soft drink bottles. Solomon Brewers Ltd operates a bottle reuse scheme whereby glass bottles are redeemed by retail distributors at \$0.50 SBD a bottle. Some tourist accommodations similarly recycle bottles and aluminium cans, ultimately for export. Some small-scale recyclers were also observed to be making use of the scheme.

As part of the APWC audit, all containers (plastic, aluminum, steel, LPB and glass) were sorted by size, material type and product type. Data show that each household, on average, produces nine (9) containers per day in Solomon Islands and almost 100% of these containers could be recycled if an appropriate deposit scheme was in place.

Figure 9: Most common beverage containers – Solomon Islands

shows the counts of the most common containers.

¹Conversion factors as per waste densities listed by Sustainability Victoria, Australia - https://www.epa.vic.gov.au/business-and-industry/lower-your-impact/~/_media/Files/bus/EREP/docs/wastematerials-densities-data.pdf

There were some common consumption trends – aluminium soft drink cans (150–500 ml) were common everywhere, but particularly in rural Guadalcanal. In fact, a higher number of alcoholic beverage containers was observed in all communities in Guadalcanal, i.e. aluminium or glass beer containers, when compared to other areas.

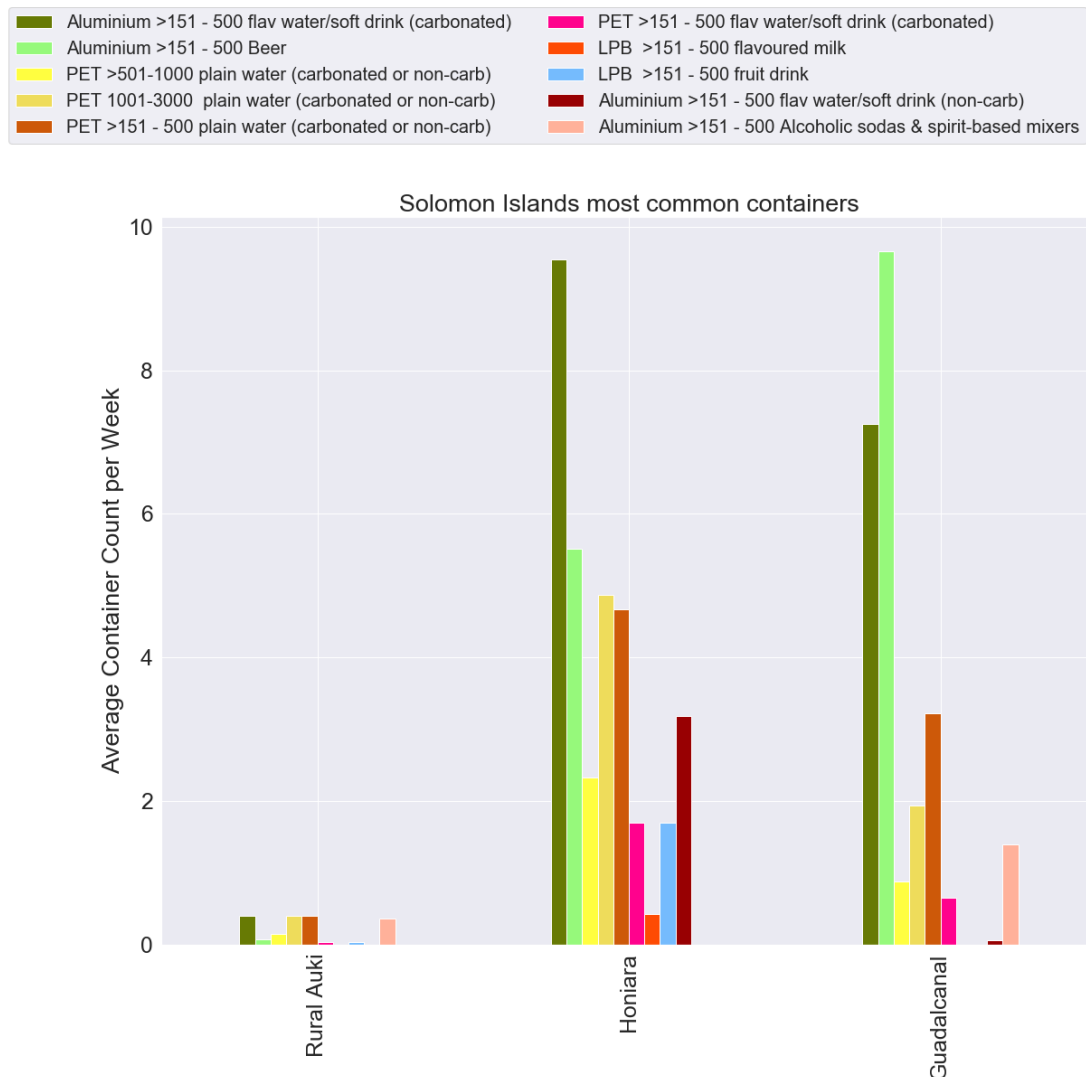


Figure 9: Most common beverage containers – Solomon Islands

The most common containers in Auki were PET bottles (water) and aluminium carbonated drink containers. Honiara returned a more even distribution of the types of containers found, with larger PET water bottles (1-3 litres), liquid paperboard fruit juice containers and aluminium cans being the most common containers.

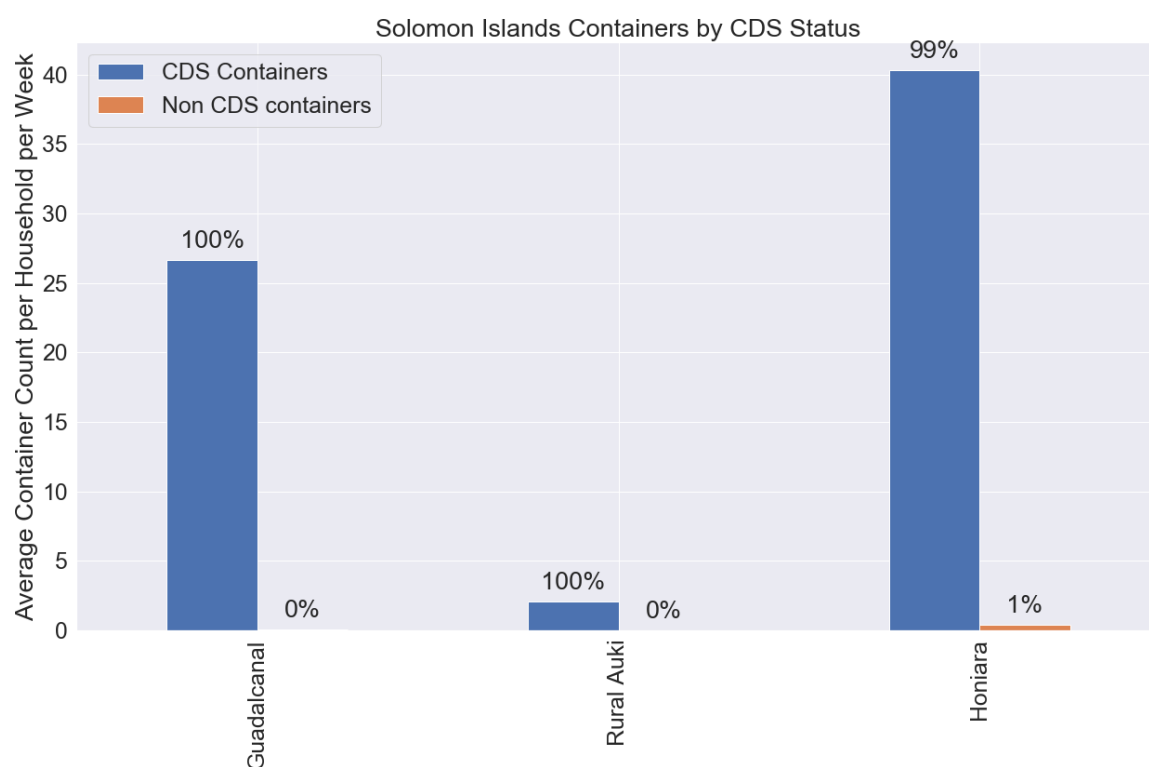


Figure 10: Containers by CDS status – Solomon Islands

Based on an extensive number of deposit legislations, APWC modelled the eligibility criteria for container legislation to be most effective in Solomon Islands. The analysis is based on the inclusions and exclusions listed in the Waste Data report. These inclusions and exclusions are only proposed based on the data available to us and would encompass more than 95% of the containers in the waste stream for most communities. This would allow for any Pacific country to become an extension of the CDS working in Australia, thereby reducing the amount of new feasibility research required.

Many bottles and cans are also under circulation within communities as these are reused for water and fuel. These containers often end up buried, burnt or in the environment when they can no longer be reused. A deposit on these containers would likely increase their return at the end of their usefulness.

Traditionally, the biggest challenges for Solomon Islands, as articulated during APWC stakeholder consultation, are the following:

- Lack of knowledge and exposure to export markets for recycled materials
- The cost of shipping materials from Solomon Islands to market is prohibitively high compared with the relatively small amount of material being generated in the country
- The cost of shipping materials from outer islands to the main islands also must be borne by the recycler
- Sending a container of recyclables out of the country incurs a tax. There have been consistent demands by the recycling sector to have this tax rebated, reduced or removed. The recycling

association that includes government representatives considers this their first action as part of the recycling association action plan.

Although the Moana Taka partnership currently exists for the movement of materials within the Pacific, it is restricted to materials of no commercial value. The proposed Pacific Regional Recycling Hub, a scheme led by the Pacific Regional Infrastructure Facility (PRIF) with the support of all donors and SPREP, will allow Pacific countries to ship recycling to a hub for consolidation and local value-adding. The feasibility study to undertake a pilot project in Fiji is proposed for 2019–2020. Used beverage containers, paper and cardboard, scrap metal, batteries, e-waste and end-of-life renewables are also included in the scope for the PRIF regional recycling hub.

APWC proposes that a strong Solomon Islands WRIA, led by a local recycler, would be well placed to communicate the need for more support for recyclers in the country. Although the association has been formed, it needs to finalise its constitution, write an action plan and articulate its most pressing needs. Data shows that there is enough recyclable material currently in circulation to help the current number of recyclers thrive. According to APWC estimates, there is about 1.5 tonnes of aluminium cans available for recycling every day in Solomon Islands from households alone. This does not include cans generated by businesses such as restaurants or resorts.

4.4 Management of nappies

Nappies have not been counted as a separate product in any previous audits conducted in Solomon Islands, making it difficult to determine the scale of the problem prior to this visit. However, residents clearly find it hard to find appropriate disposal methods for disposable nappies.

In communities where there are no collection systems in place, disposable nappies are being buried, burned or dumped in water. Given that this applies to most of Solomon Islands, the rate at which nappies are accumulating in the environment is rivalled only by PET bottles and plastic bags.

APWC suggests the solution to the growing problem of nappy disposal is the introduction of a small, community-scale nappy composting system, especially on islands where there is no collection available. The same system could be scaled up to compost nappies at a municipal level in a place such as Honiara where little community land is available for the introduction of a communal nappy composting site.

For such systems to be viable, reusable and compostable nappies must be made available to the community at an affordable price and at competitive cost with the traditional plastic-containing nappies. This would involve researching the current tariff on nappies with plastic versus compostable and the composability of the compostable nappies.

The introduction of nappy composting should be aligned with a community-level education campaign focused on reusable nappies and the benefits of such a scheme.

4.5 Plastic bag ban

Approximately 4.4% of the overall waste collected from households in Solomon Islands is plastic bags. Interestingly, this percentage increases to 6.6% in urban areas and drops down to 2.9% in rural areas (see **Error! Reference source not found.** and Figure 12).

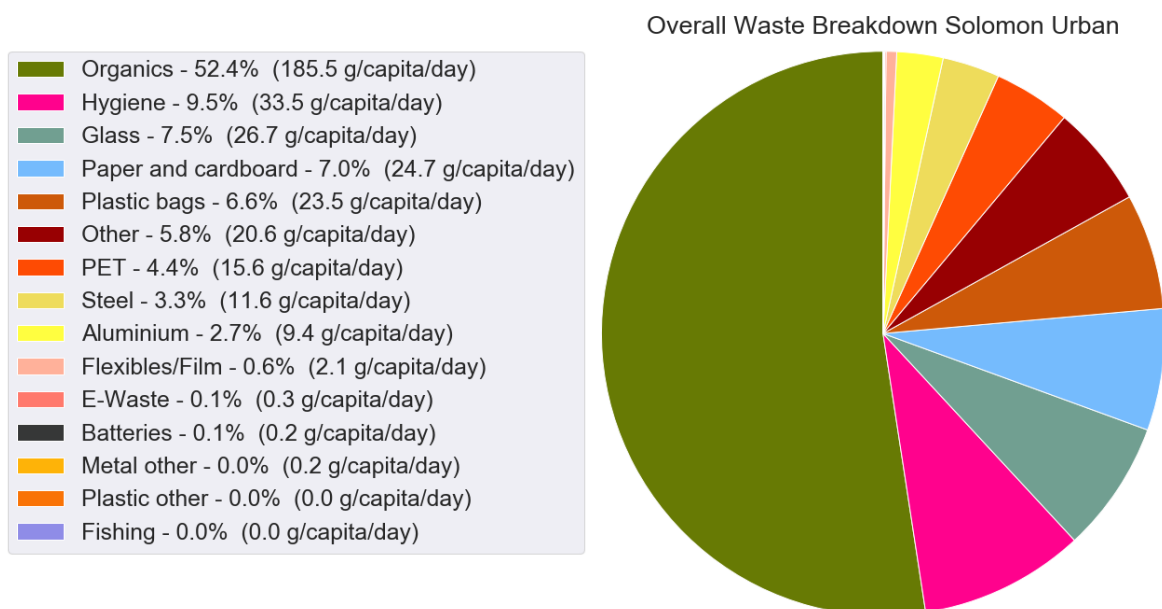


Figure 11: Breakdown of waste in urban Solomon Islands

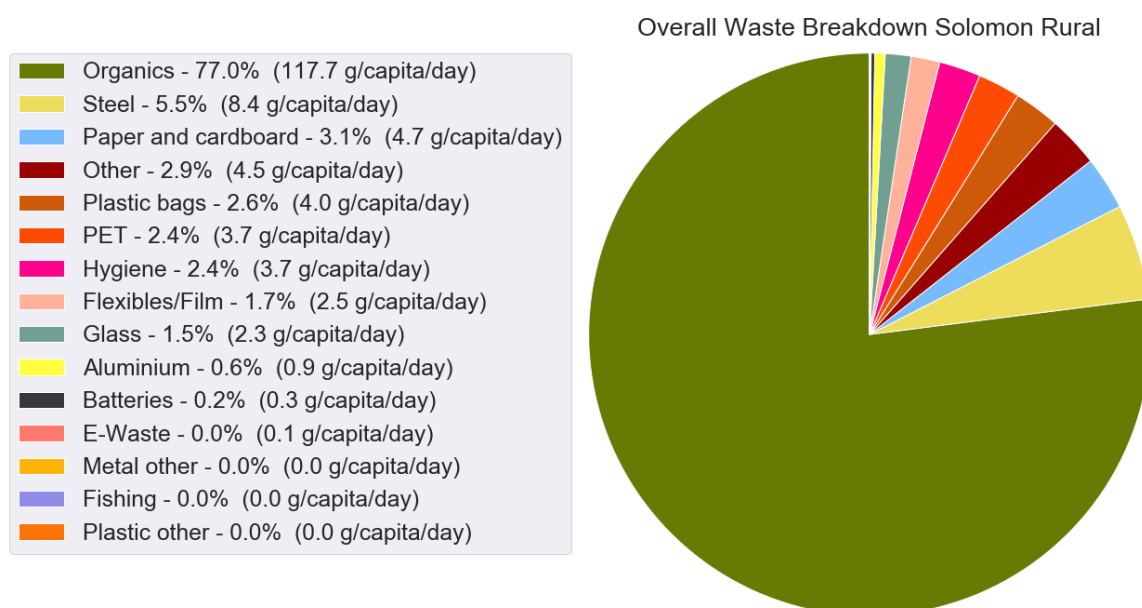


Figure 12: Breakdown of waste in rural Solomon Islands

After recyclable aluminium and PET, plastic bags were the most common items found in the household waste audit conducted by APWC. For Honiara alone, that amounts to 1.3 tonnes of plastic bags generated per day by households (based on 32.8 tonnes per day going to landfill as per J-PRISM II data). Further analysis was performed to understand the types of bags generated in Solomon Islands. Data shows that almost 100% of the bags found in household waste were shopping bag less than 300 gsm.

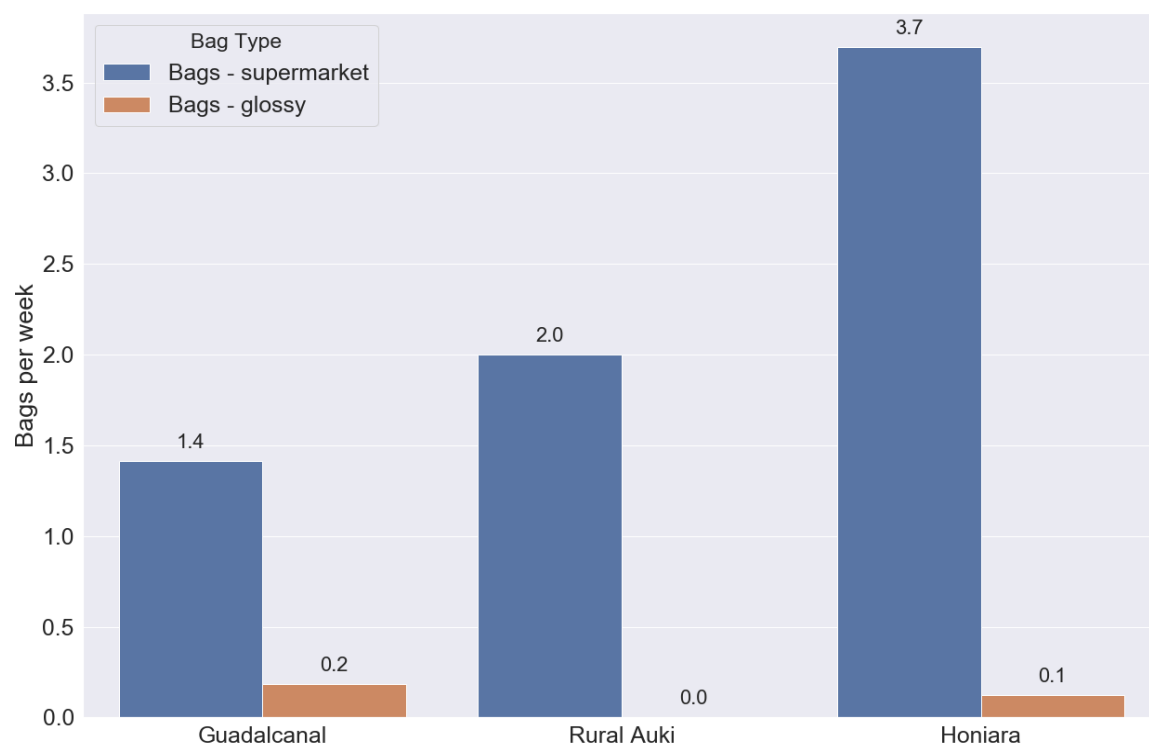


Figure 13: Supermarket vs. glossy bags found in household rubbish

This implies that a plastic bag ban, similar in nature to Vanuatu's, covering shopping bags only, should help remove almost 99% of plastic bags from the household waste stream. However, there are lessons to be learned from the implementation of Vanuatu's ban and Solomon Islands staff would benefit from an ongoing collaboration with their colleagues in Vanuatu to implement such a scheme.

5 Stage 2 - The Best Practice Showcase

5.1 Overview and objectives

An intensive three-day training and development opportunity was delivered on 4–6 February 2019 in Sydney. The objectives the showcase were to:

- Transfer knowledge and ideas to the Pacific context;
- Share learnings from similar problem waste streams that have been tackled;
- Provide forward insight into ideas that are currently being developed for delivery;
- Build a collaborative relationship between Australia, Solomon Islands and Vanuatu.



Image 7: Day 1 Best practice showcase attendees

There were various reasons for holding the best practice showcase in Sydney. These are below:

- a) Previous showcase projects through JICA and SPREP had undertaken study tours to Fiji and other Pacific islands and some of the selected stakeholders had already attended these trips.
- b) Three major activities of great interest to Vanuatu currently are deposit legislation, organics management and the formation of a Recycling association. The intent of the Sydney program was to ensure that the participants got a well rounded foundation on the principles of both deposit legislation and composting as well as establish ongoing connections with the waste and recycling association in Australia due to its 25 year history.

The delegates were chosen based on the following criteria:

- Management of waste collection services in each country
- Management of landfill in each country
- Management of waste management policy in each country
- Overview of country level waste management activities through the Ministry of Environment
- Management of finances at the municipality level.

Delegates from Vanuatu, Solomon Islands and collaborative organisations including JICA and SPREP attended. Seminars were hosted in the Waste Contractors and Recyclers Association of NSW (WCRA) offices and site visits arranged so that delegates could observe waste management practices first hand. Table 3 outlines the programme that was delivered.

Table 3: The Best Practice Showcase three day programme

Day 1 04 FEBRUARY 2019		
9am–9.30am	Welcome	Anne Prince and Amardeep Wander (APWC)
9.30–10am	Recycling after the China Ban	Tony Khoury (WCRA)
10am–11am	Proposed solution for the Pacific	Jack Whelan (PRIF) and Anne Prince
11am–11.30am	Morning tea	
11.30am–12.45	WCRA – Association what is it, how does it work?	Tony Khoury
11.30am–12.45pm	Associations in the Pacific	Amardeep Wander (APWC)
	How can associations benefit from working with WCRA and how will they contribute to the recycling hub?	Tony Khoury and Anne Prince
12.45pm–1.15pm	Lunch break	
1.45pm–2.15pm	Contracts – How to use and transferability	Miriam Cumming (APC)
2.15–5:15pm	Concrete recycling	SITE VISIT – Fairfield Council
	E-waste	SITE VISIT – Sims Recycling Solutions e-waste, Villawood
	Container Deposit Scheme Reverse Vending Machine	SITE VISIT – Woolworths, South Granville
Day 2 05 FEBRUARY 2019		
9am–10am	WHS and training	Tony Khoury (WCRA)
10am–10.30am	Policy Options for the Pacific	Amardeep Wander (APWC)
10.30am	Morning tea	
11am–12.30pm	CDS in Australia and overseas overview CDS in NSW Questions and Answers	Anne Prince and Peter Bruce (Exchange for Change)
12.30pm–1pm	Lunch	
1pm–4pm	Visit to Bucher Municipal (small collection trucks, balers, bins, street sweepers, etc.)	SITE VISIT – Bucher Municipal Luke Aitken

	Presentation from Ace Waste (clinical waste)	John Homewood (Ace Waste)
	Presentation from Paintback Limited	Mark Pobje (Paintback)
4pm	Discussion: Where to next?	Session moderated by Tony Khoury (WCRA)
Day 3 06 FEBRUARY 2019		
9am–5pm	HANDS ON BEST PRACTICE DEMONSTRATION – ALL DAY Topics covered: <ul style="list-style-type: none"> • Composting • Worm Farming • Wick beds • ANL and large scale composting • Metal and e-waste drop-off • Concrete recycling • Dry landfilling • BuyBack centre • EcoHouse and Garden workshops and school engagement • Artists' programme 	SITE VISIT – Kimbriki Resource Recovery Centre Peter Rutherford and Mark Winsor

5.2 Summary of the Showcase experience – Day one

5.2.1 Day 1- Seminar series

Following an introduction from Anne Prince and Amardeep Wander of APWC on day one of the showcase, the delegation heard from WCRA's Executive Director Tony Khoury on the impacts of the China ban on the Australian recycling industry. Tony expanded on the issues facing the industry, including areas such as the adjustments required to address contamination and the lack of viable options and pathways for recyclable material that, for years, has been accepted and processed in China.



Image 8: Tony Knoury talking about the China ban and impacts on Australian markets

Jack Whelan (PRIF) and Anne Prince then presented on proposed solutions for the Pacific. This session focused on the unique issues faced by operators and governments while they plan to tackle a growing and ever diversifying waste stream.



Image 9: Anne Prince and Jack Whelan presenting a proposed pacific hub

It was evident that differing countries have different issues with localised social and economic impacts affecting efforts to assist in the Pacific. APWC was clear that the first step is to capture and record

data with integrity. This data then forms the basis of measurement for success in programmes across the entire region.

Many solutions were proposed and debated. The overlying theme was that current programmes must be based on focus areas that can be transferred successfully from countries such as Australia only if they can be adopted and thrive in the Pacific. Solutions that require major shifts in the culture and current way of life for Islanders will most likely be unsuccessful.

Tony Khoury presented to the delegation to share the history and success of the WCRA organisation for its members in NSW and the ACT. Tony explained the importance for waste and recycling operators to have an industry body that can represent them at all levels of government. The establishment of organisations similar to WCRA in the Pacific may assist in industry being able to steer and influence policy, regulation and law in the region.

WCRA members have a voice from industry to influencers and policy makers that facilitates communication and information independent of individual aspirations of its members. The delegates were impressed with the longevity and success the WCRA has delivered for its members and believed that similar bodies in the Pacific will allow industry and governments to work with PacWaste (and other associations) to achieve waste management goals and objectives. PacWaste (Pacific Hazardous Waste) is €7.85 million, a four year project funded by the European Union and implemented by SPREP to improve regional hazardous waste management across the Pacific in the priority areas of asbestos, healthcare waste, E-waste and integrated atoll solid waste management.

Anne Prince then joined Tony Khoury for a facilitated discussion on the benefits for associations from working with WCRA and shared examples. These examples were discussed with the delegation, with ideas and concepts being explored for their transferability to the Pacific region.

The delegation then welcomed Miriam Cumming, Environmental Engineer, APC Waste Consultants to present on NSW EPA Model Contracts. Following an introduction of the NSW experience, Miriam Cumming led a workshop on how these contracts may be used in the Pacific and their transferability.



Image 10: Miriam Cumming's presentation on Contracts led to healthy discussions

The workshop covered a varying list of both contracts and waste initiatives in NSW. Discussion on how these contracts may be adopted in the Pacific ensued. For successful adoption any contract must consider the objectives and outcomes that can be achieved in the relevant area of the Pacific. The delegation took away many ideas for improved contracts in their respective countries.

It was evident that the collection and recording of data with integrity would form the basis for planning and infrastructure. It was also clear that this data would be integral in the measurement of success of the varying projects. Data and the results could be compared across countries, geographies and types of ecology to identify areas of success and failure and learnings from both.

5.2.2 Day 1 – Site visits

The first of the afternoon site visits was to the Fairfield Council's Construction and Demolition (C&D) waste facility in Wetherill Park. The reason for a visit to this facility were two fold. First, this local council went on a thirty year journey from small scale manual processing of building material to one of the most commercially successful C&D recycling businesses in the country. Secondly, processing of C&D material has a direct link to how disaster wastes are managed in the Pacific.



Image 11: Fairfield council concrete recycling facility. A jaw crusher attachment for an excavator is the most useful piece of equipment for concrete recycling

The tour, while cursory, shared many ideas with the delegates on how simple waste management may be achieved in their countries. Areas such as concrete and brick recycling into finished goods such as road-base and aggregates were of interest to the delegates. It was clear that the processing could be adopted at a macro level and then modified to create jobs. Particular attention was paid to the in-bound processes of waste segregation and the fact that although many of the Fairfield Council processes were automated, they could be adopted in a manual form in the Pacific. Disaster waste management was also a focus of this visit and the delegates seemed to take away many ideas and points for discussion from the C&D waste facility.

Sims Recycling Solutions (SRS) was the next stop on the tour. SRS is a leader in electronic waste solutions in Australia, with its Villawood site equipped with a shredding and downstream separation process for e-Waste.



Image 12: Visit to e-waste recycling facility

Electronic waste is one of the fastest growing waste streams in the world. There are many hazardous items such as lead, mercury and other heavy metals. The opportunity for batteries to spark and feed fierce fires or pollute the environment is also a focus for Pacific waste management. SRS staff took the delegation for a tour of the facility. The reality for the delegates is that under the current and short-term future waste management strategies in the Pacific a facility such as this would not be likely to be commissioned. The opportunity for e-Waste management is in two key areas, employment and the creation of export markets for commodities. Low labour costs and the ability for operators to derive clean streams of commodities by hand dismantling e-Waste both contribute to the strong possibility that e-Waste dismantling may be successful in waste management in the Pacific.

A NSW Container Deposit Scheme (CDS) “Return and Earn” collection point was the last stop on the tours for day one. Delegates were extremely interested in seeing the general public arrive at the collection point to recover their ten cents per eligible container. As with the SRS plant, the likelihood of an automated CDS collection point being commissioned in the Pacific was considered by the delegates. Delegates quickly identify that a programme such as CDS encourages the collection, compliant processing and recycling of waste.

In any form, successful CDS that rewards the collection and recycling of containers or other items is a positive opportunity for the Pacific, and this site visit at the end of day one prepared the delegates for some of the presentations planned for day two.

5.3 Summary of the Showcase experience – Day two

5.3.1 Day 2 – Seminar Series

Day two began with a presentation from Tony Khoury on workplace health and safety (WHS) and training. The benefits of policies and procedures for managing safety were shared with the delegates. Discussion on the differing cultures across the regions and the relatively relaxed approach to managing safety weighed heavily with the delegates. Concern for the timeline of implementation was a major point of discussion. Major shifts in current thinking and action would have to take place to facilitate improvements in workplace health and safety.



Image 13: Tony Khoury's opening session on Work Health and Safety in waste

Anne Prince, APWC, then presented on policy options for the Pacific. This presentation expanded on areas discussed during day one especially the plastic bag ban and was followed by discussion between the Vanuatu and Solomon Islands colleagues on the challenges and successes of how to implement such an activity.

Peter Bruce, CEO Exchange for Change, and Anne Prince jointly presented on the CDS in Australia. Focus was placed on the “Return and Earn” programme in NSW and the areas of difference in Queensland and Western Australia. Exchange for Change is a Joint Venture of five of Australia’s beverages companies who together sell more than three quarters of the containers eligible for a refund under the NSW (New South Wales) Container Deposit Scheme. Member companies have more than 40 years’ experience managing similar refund programs within other States within Australia. It is one of three organisations responsible for running the NSW deposit scheme ‘Return and Earn’.



Image 14: Peter Bruce, CEO for exchange for Change sharing the Australian journey of introduction of the Container Deposit Scheme

The delegates were interested in the concepts of manufacturers and importers being financially required to incentivise recycling. In the Pacific, monetary reward for the collection and disposal (to a compliant point) could result in significant reductions in the amount of waste entering waterways. Although the mechanics behind the schemes would most likely vary from the models in Australia, the concept and the success of the collections in Australia was encouraging for the delegates to take home and discuss.

5.3.2 Day 2 – Site tours

The site tour for day two was hosted by the team at Bucher Municipal. The team from Bucher gave a presentation prior to the tour. It was evident that in Australia (and globally) Bucher are the leaders in the manufacture of waste management collection vehicles and supporting infrastructure.



Image 15: The local ute-based truck designed for a project in Indonesia that was of high interest to the delegates

The delegates were impressed with the range of equipment, particularly when shown the smaller, more agile options. It was evident that a 20-plus tonne front-lift truck is not an option for waste management in the Pacific. In fact, the delegates shared that wheelie bins and other systems in use in Australia were also not in the short to medium plan for their countries. Generating most interest were the smaller systems that could be adapted to fit onto a 4WD cab chassis or similar small truck were of most interest.



Image 16: Bucher municipals range of equipment was appreciated by the delegates

During the tour, the delegates gravitated to the small truck that had been fitted with a simple compactor and rear-lift system. The operations teams at Bucher demonstrated the products and there was clear interest in the possibilities for adopting these systems.

On arrival back at the WCRA offices, John Homewood, CEO of Ace Waste, owner and operator of two medical waste incinerators in Brisbane and Melbourne, gave a detailed and technical explanation of the company's operations. Ace Waste is a leader in the collection, transport and compliant disposal of hazardous waste and has the capability to assist Pacific nations with difficult medical waste types such as cytotoxic human waste, out-of-date pharmaceuticals and various complex clinical waste streams.

Discussion centred on the relative lack of success in projects such as incineration across the Pacific. Concerns for the delegates included factors such as the lack of power and fuel, the long time frame for storing clinical waste and the vast distances over which waste had to be transported.

Engaging a processor such as Ace Waste would be an exceptional option for the Pacific. However, with the population spread over many thousands of kilometres, logistics and sanitary control of storing waste are issues that must first be addressed.

Mark Pobje, NSW Business Development Manager, Paintback Limited (PBL), then presented on the Paintback product stewardship scheme in Australia. PBL is a voluntary product stewardship scheme established by the manufacturers of paint in Australia. PBL is funded by a fifteen cents per litre fee for each litre of paint sold in Australia. The objective of PBL is to provide Australians with a drop-off site close to their home to enable them to dispose of residual paint. PBL then collects and processes this paint in a compliant manner in line with best practice in Australia.

PBL has had considerable success, with more than 100 collection points servicing 17.5 million Australians. PBL invests considerably in research and development to work collaboratively with the liquid recycling and treatment facilities to identify areas where processing can be improved. During

2017–2018 PBL collected over 4.3 million kilograms of paint and paint packaging across its network, successfully surpassing the collection rate of 1.9 million kilograms in the previous and maiden year of the scheme in 2016–2017.

The delegates were (as with the CDS) interested in the mechanics and possibilities of adopting similar EPR tariffs or fees to fund programmes across the Pacific.

Bradley Nolan from SPREP then summarised the next iteration of the PacWaste Plus Project in the Pacific. Brad outlined the new funding model and objectives for SPREP and its team. This project has recently been established and funded. Objectives have grown to incorporate more waste streams and major focus will be on disaster waste, asbestos management, plastics, e-waste and medical/clinical waste.



Image 17: Bradley Nolan from SPREP presenting the availability of funds through the PacWaste Plus program

The final session of day two at WCRA was a chance for the delegates and presenters to discuss a wide variety of issues relevant to waste management in the Pacific Islands. Discussion and debate was varied across all areas covered in the first two days.

5.4 Summary of the Showcase experience – Day three

A full-day site visit was conducted on day three of the training. Established in 1974, Kimbriki resource recovery centre is a former landfill site. The day started with hands-on demonstration of composting,

worm farming, wicking beds and a range of other activities. Based on the feedback, this session at Kimbriki and the visit to Bucher Municipal with local solutions specific to the Pacific were a highlight of their three day visit to the Best Practice Showcase.



Image 18: Delegates getting their hands dirty learning small scale composting and wick bed preparation

The EcoHouse and Garden provides a hands-on approach to education and behaviour change through tangible methods of demonstrating material reuse. The building is constructed from recovered materials from the Kimbriki site and has become an information and education centre targeting all ages and users. Peter Rutherford, senior eco-gardener at Kimbriki, conducted the tour that included hands on demonstration of the following:

- Composting;
- Worm-farming;
- Wicking beds (self-watering gardens);
- Small-scale organic vegetable gardening;
- Organic horticulture for tradespeople;
- Natural food preserving;
- No dig gardening.

The tour started with Peter Rutherford taking everyone on a musical journey introducing the concept of “ecology”; of preserving and caring for the environment in everything you do and everywhere you go.

The delegates were enthralled by the idea and were very impressed by the communication strategies used by the team at Kimbriki. Of note was the comment that the delegates would like to be able to use music to connect people to the environment given music is an integral part of the Pacific way of life.



Image 19: Musical introduction to composting



Image 20: Worm farming demonstration

The afternoon was devoted to visiting the rest of the Kimbriki site and was led by Mark Winser, the CEO of Kimbriki.

This high diversion rate at kimbriki is achieved through the various channels that waste is received and then sorted. Materials are separated for drop-off (Figure 14), and then further reviewed and sorted by staff. This contributes to the large volume of waste that is diverted from landfill and is reused or recycled. It also directs goods towards the BuyBack centre so that any items of value are available for purchase by the public.

Operating from Kimbriki, Australian Native Landscapes recycles vegetation and wood waste. A variety of loose, bulk and bagged products are available for sale, including mulches, composts and other

garden-suitable organic mixes. Similarly, Concrete Recyclers accepts waste concrete, brick and roof tiles to produce road bases, aggregates and sands of varying grades suitable for construction and landscaping use.

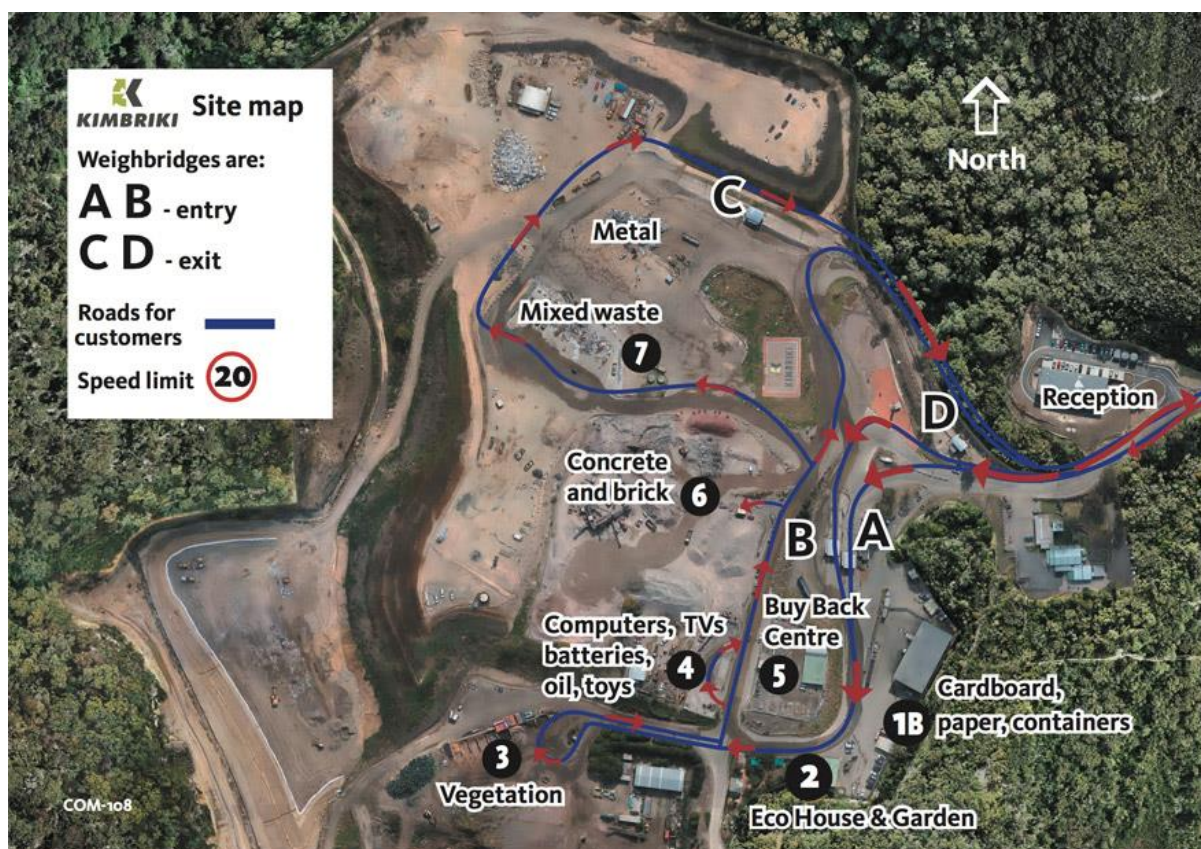


Figure 14: Site map of the Kimbriki resource recovery centre

During the visit, the delegates took in the following:

- Community drop-off of materials that are hand sorted to recover all recyclable and reusable materials
- All re-usable materials are available for re-use and sold back to the community generating income for the facility a concept that was of great interest to the delegation
- Community drop-off of metal, TV, computers, batteries, oils and even toys that are reused.

5.5 Delegate Evaluation of the Best Practice Showcase

Feedback was collated at the end of each day to evaluate the success of the Showcase's objectives against the expectations of the delegates, as well as to inform any similar programmes that may be delivered in the future. The results in Figures 15, 16 and 17 below show a high level of enthusiasm for the learning and development opportunity the Showcase provided. There was a constant theme during discussions and within the formal feedback that the content and best-practice examples needed to be transferrable to the Pacific communities and their current cultural, social and economic realities. Given the long-term nature of waste management decision making and investments, insights

into contemporary practices laid a solid groundwork for delegates to envisage the future of waste management in their representative nations.

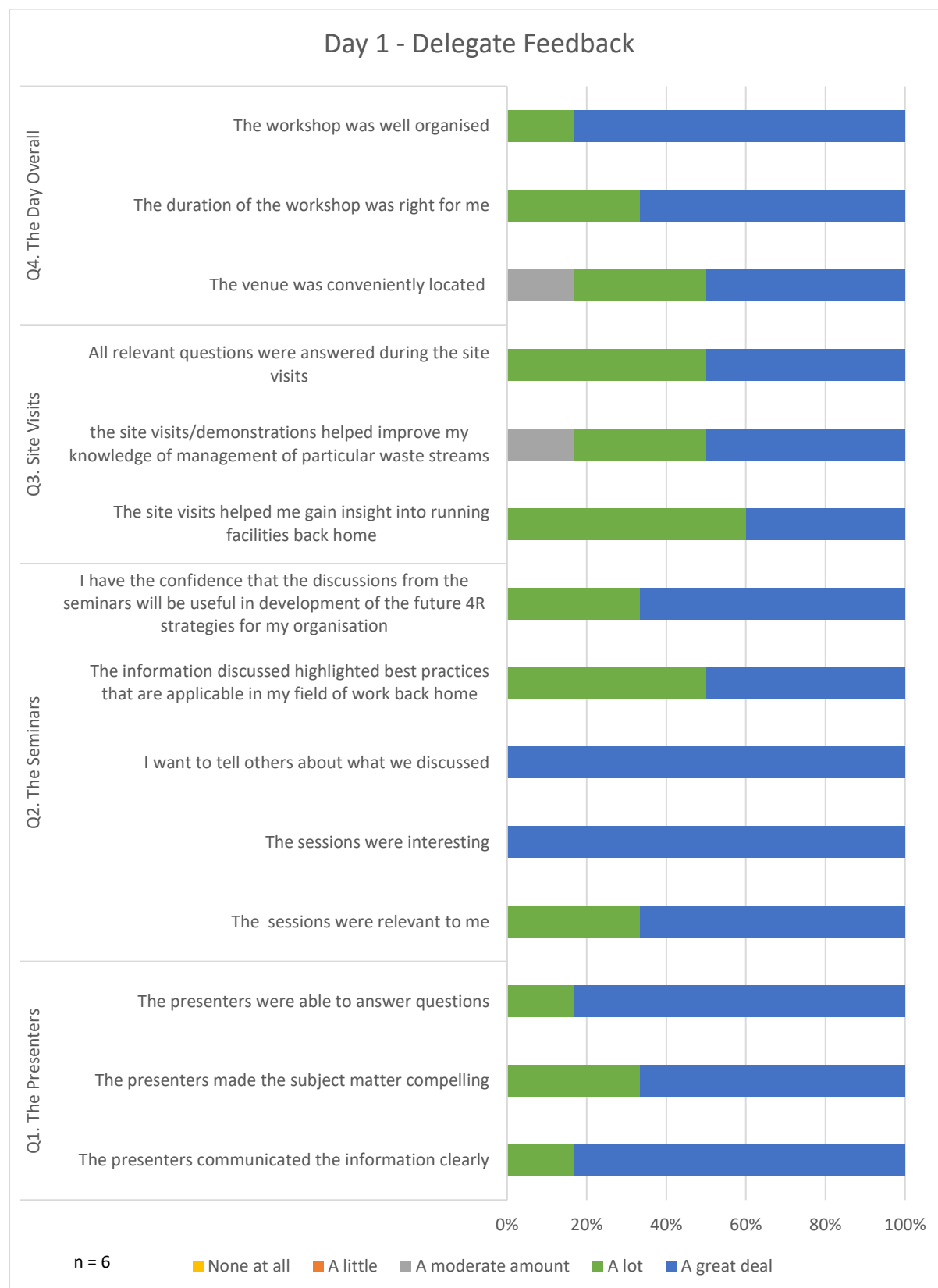


Figure 15: Delegate evaluation of Day 1

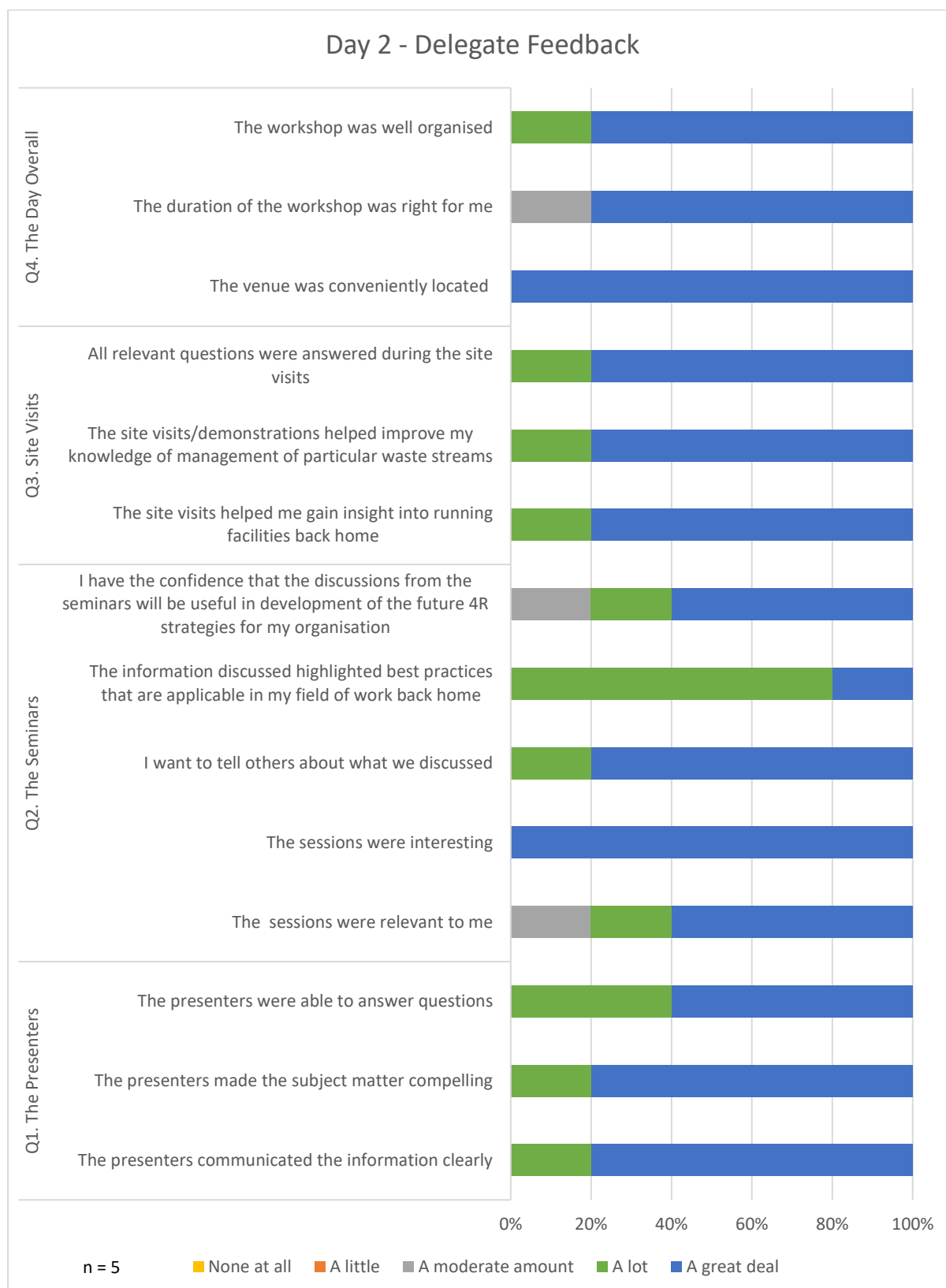


Figure 16: Delegate evaluation of Day 2

Day 3 - Delegate Feedback

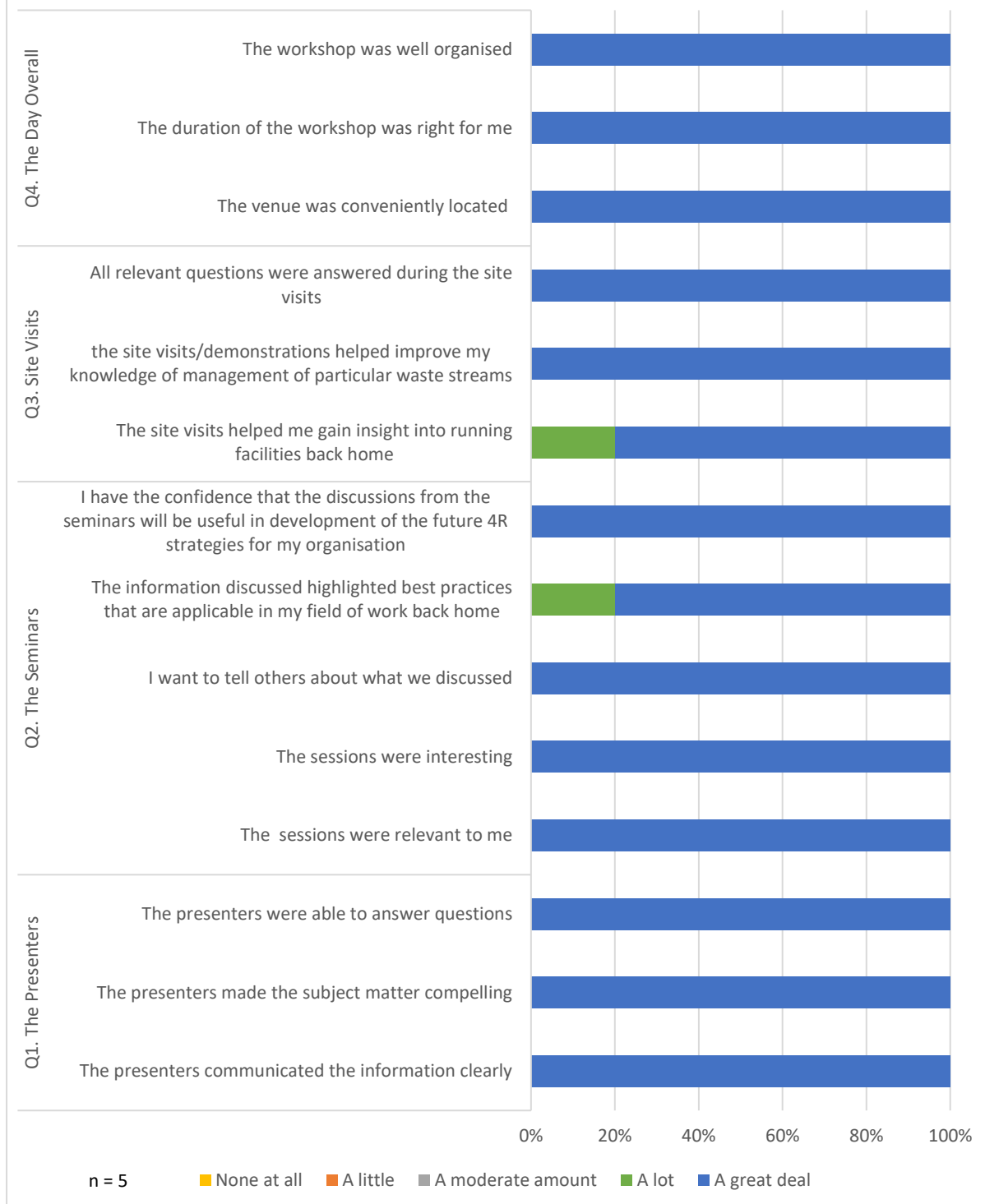


Figure 17: Delegate evaluation of Day 3

Delegates were asked whether it had proven difficult to obtain a visa to attend the seminar. Although this was part of a commonwealth project with full UK, Solomon island and Vanuatu support, visas were denied by Australia. This was the basis of asking this question. Half answered it had not, while the remainder responded in the affirmative. Delegates were also asked to nominate which sessions they thought were the most useful and which areas could be improved. These results for both days are in Table 4.

Table 4: Free text feedback provided by delegates to inform future programmes

Q6	What was the best aspect of the session?
DAY 1	<ul style="list-style-type: none"> • Common discussion of each topic best practice in waste management • Contract management is key issue in my responsible country and so the contract session was most impressive to me. Of course, all other sessions contents are precious information • Site visits • Field visit and session on contracts and the proposal for the regional hub • The work contract • Hearing about recycling refunds
DAY 2	<ul style="list-style-type: none"> • Bucher Municipal site visit • All the sessions considered 'applicability' which was the best point, I think • The history of WC and RA by Tony Khoury. Visit to Bucher Municipal and their presentation • The CDL Presentation. Presentation and visit to Bucher Municipal • Looking at the different CDS systems and the set up of the association
DAY 3	<ul style="list-style-type: none"> • The best session for me was the home composting. To try and encourage people to do composting at source. The worm farm was really interesting as well • 1. The organic farm - presentation • 2. The site visit in landfill site – very impressive • The home composting part is the best aspect of the session • The practical composting and the lessons learnt from Peter Rutherford • Compost demonstration was the most impressive session. I really like the way Peter explains the method

Q7	What aspect of the sessions needs improvement? What would you like have heard more about?
DAY 1	<ul style="list-style-type: none"> • For presenter to allow more questions
DAY 2	<ul style="list-style-type: none"> • Otherwise keep the presentation simple – depends on the target audience. Also good information are shared at informed discussion • The CDS and Return Method • Presentation that more applicable to our situation. • I would like a bit more information on the CDS or the stewardship programme. The conversion and how to calculate the amount to be included in the levy
DAY 3	<ul style="list-style-type: none"> • I would like more information on the wicking bed. Maybe some trial/pilots. Would be useful for places that have limited water like in the • 1. Policy makers and legislators, decision makers. 2. Technical people in the island who work in the landfill be part of the team visit. 3. • If possible to help develop an action plan or project proposal to get fund particularly to address main issue or problem that each country • Maybe if we could have more time to develop some ideas based on the knowledge from training would be nice. I guess it will be done in-

6 Lessons learned

6.1 Visa Issues

APWC issued invitations to six staff members from each country (Vanuatu and Solomon Islands) were invited to attend the Best Practice Showcase and arrangements were made for their flights and stay. However only two delegates from each country and two from the Pacific regional organisations of SPREP were able to attend. Delegates found it difficult to obtain a visa within the timeframes available to them for attendance at the seminar series.

Unfortunately, due to the requirements of the project, APWC was not able to move the dates of the Sydney showcase to allow in-country staff to have visa to attend the showcase.

In future, any project that requires movement of people between countries that require a visa should have at least three months lead time to allow an appropriate time for visa processing and staff availability.

6.2 Ongoing support

It was noted by most delegates during discussions that there are various learnings that they can take away from the Best Practice Showcase and apply to their country context. However, they do not have the expertise to ensure that the project goes well from inception to completion and they will need ongoing support to ensure the success of such projects.

APWC notes that the PacWaste Plus program will offer support to local governments in both Vanuatu and Solomon Islands. The details of the funding program were presented at the showcase by Bradley Nolan, Project Manager for PacWaste.

6.3 Nation-specific examples

The Best Practice Showcase has paved the way for tailored in-country training to take place. Within the Solomon Islands this was held in March 2019 and concentrated on areas highlighted by the delegates that they needed further support.

APWC will provide a further report detailing the in-country training methodology, areas of focus and evaluation.

7 References

Acoleyen, M., Laureysens, I., Lambert, S., Raport, L., van Sluis, C., Kater, B., & Ferreira, M., 2013. Marine litter study to support the establishment of an initial quantitative headline reduction target. Final report–SFRA0025.

Jambeck, JR., Geyer, R., Wilcox, C., Siegler, Theodore R., Perryman, M., Andrady, A., Narayan, R, Lavender Law, K., 2015. 'Plastic Waste Inputs from Land into the Ocean'. *Science*, Vol. 347(6223). pp. 768-771. DOI: 10.1126/science.1260352.

J-PRISM II, 2017. Report on Incoming Vehicle Survey at Ranadi

McIlgorm, A., Campbell, H. F., & Rule, M. J., 2011. The economic cost and control of marine debris damage in the Asia-Pacific region. *Ocean & Coastal Management*, 54(9), 643–651.

Ocean Conservancy and International Coastal Cleanup. 2014. Turning the Tide on Trash: 2014 Report. Washington, DC. Available: <http://goo.gl/oa7kj>

Seltenrich, N., 2015. New link in the food chain? Marine plastic pollution and seafood safety. *Environmental Health Perspectives* 123(2): A34–A41; doi:10.1289/ehp.123-A34

UNEP and GRID-Arendal, 2016. Marine Litter Vital Graphics. United Nations Environment Programme and GRID-Arendal. Nairobi and Arendal. www.unep.org, www.grida.no

Werner, S., Budziak, A., Van Fanneker, J. A., Galgani, F., Hanke, G., Maes, T., Matiddi, M. Nilsson, P., Oosterbaan, L., Priestland, E., Thompson, R., Veiga, J. and Vlachogianni, T., 2016. Harm caused by marine litter, MSFD GES Technical Group on Marine Litter — thematic report; JRC technical report; EUR28317 EN, Publications Office of the European Union, Luxembourg, 2016. <https://doi.org/10.2788/690366>.



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Head office

Centre for Environment, Fisheries & Aquaculture
Science
Pakefield Road
Lowestoft
Suffolk
NR33 0HT
Tel: +44 (0) 1502 56 2244
Fax: +44 (0) 1502 51 3865

Weymouth office
Barrack Road
The Nothe
Weymouth
DT4 8UB

Tel: +44 (0) 1305 206600
Fax: +44 (0) 1305 206601



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