APPENDIX A

TERMS OF REFERENCE

SCHEDULE 1: TOR & STUDY PLAN

TERMS OF REFERENCE

GUIDELINES FOR SOLID WASTE DISPOSAL SITE MANAGEMENT IN PACIFIC ISLAND COUNTRIES

BACKGROUND

Disposal of wastes is a world wide problem. The small island developing states of the Pacific (Pacific SIDS) increasingly share in this problem. As the economies of the island states develop and move toward cash based, consumer goods society, the volume and complexity of waste products increase. However, unlike the mainly organic waste of the past, much of the modern waste stream may take many years to break down. Some components of the waste may be harmful.

While Pacific SIDS may differ in terms of topography, climate, population density, economic development, land use, and geology, they share the following features:

- Limited land availability; and high population density in urban centres;
- Limited institutional capacity and financial resources;
- Poor waste disposal practices and storage of waste generated;
- Limited scope for recycling and recovery; and limited collection and transport services;
- Lack of treatment and disposal facilities for special wastes; and stockpiling of special wastes.

Inadequately managed waste disposal has the potential to affect the health of the people, damage the environment of the islands and be a barrier to economic development.

In any waste management operation, a number of options are available for the solid waste component of the waste stream. These include separation, by-product recovery, and volume reduction, with the remaining solid wastes disposed of in rubbish dumps and landfills. In most Pacific SIDS, the final disposal commonly takes place either at official or unofficial open dumps. These sites have a low initial capital investment and operating cost. However, the environmental and health impacts of such operations are potentially very high, and the lack of monitoring of the dumps and the surrounding land and water is a matter of major concern. It is often argued that existing open dumps should be closed and controlled landfills constructed in their place. However, in view of the severe technical and financial constraints many Pacific SIDS face, practical reality is likely to necessitate that attempts must first be made to place a measure of control over open dumping practices and gradually upgrade the sites.

It is in this context that the Government of Japan through the Japan International Cooperation Agency (JICA) has commissioned the development of regional guidelines for the proper management of solid waste disposal facilities in Pacific SIDS. JICA's previous activities in this field have highlighted the need to tailor assistance to better suit conditions present in Pacific SIDS. These guidelines will assist JICA identify appropriate and practical ways to provide effective and sustainable assistance for solid waste disposal site management in Oceania.

OBJECTIVE

The development of regional guidelines for the proper management of solid waste disposal sites in urban areas in Pacific SIDS.

These guidelines will be used by JICA in Oceania to help select, design and implement more sustainable activities in this field in the future.

SPECIAL REMARKS

Three island types make up the Pacific SIDS: volcanic, atoll and large islands. In addressing each of the requirements in the Scope of Work, the Guidelines shall note the similarities and specify the characteristics and issues particular to each island type.

SCOPE OR WORKS

1. Review existing documentation on solid waste disposal management in Pacific SIDS, including the following reports:
   i) Guides for Municipal Solid Waste Management in Pacific Islands Countries, Healthy Cities, Healthy Islands Document Series No.6 WPRO/WHO, December 1996
      - Annex 8: Landfill Site Selection Procedure
      - Annex 9: Guidelines for Scoping Environmental Impact Assessment of Municipal Solid Waste Landfill
      - Annex 11: Design of a Controlled Landfill
      - Annex 12: Procedure for Manual Landfill Operation
   ii) Waste Management in Small Island Developing States in the South Pacific, UNEP/SPREP, Canberra, May 1997
      - Suggested 3 Stage Approach to Upgrading a Landfill Operation
   iii) "A Road to Sanitary Landfill", JICA and Ministry of Housing and Local Government, Malaysia, October 1990
   iv) "What is the Fukuoka Method?", Yasushi Matsufuji

2. Provide an overview of the prevailing situation in solid waste disposal management in Pacific SIDS, including cultural, institutional, legal and financial issues:
   a) Identify and explain the main issues;
   b) discuss and evaluate the options available to Pacific SIDS to address these issues; and
   c) use specific examples to illustrate the points made in this overview.

3. Review and report on the activities of other donors and regional and international organisations in solid waste disposal site management in Pacific SIDS:
   a) Identify the activities of these organisations;
   b) examine the major issues that these organisations face in providing assistance in this field, including issues of sustainability - such as appropriate environmental and safety standards, and recurrent cost financing and assets maintenance;
   c) describe the approach of these organisations to these issues.

4. Prepare a landfill management plan addressing the following points:
   - landfill design and operation;
   - access roads; and access to working face;
   - site security;
   - site facilities and equipment;
   - acceptable waste types and waste acceptance procedures;
   - disposal of special wastes;
   - management of storm water, leachate and landfill gas;
   - application of cover materials;
   - control of dust, litter, noise, odour, vector/vermin and birds;
   - worker health and safety; emergency response; and complaints;
   - measures that will improve the management of an open dump;
   - training, equipment and maintenance requirements.

   The Plan shall address the variety of conditions and dump/landfill sites existing in Pacific SIDS.

5. The Guidelines shall include recommendations on realistic ways to provide effective and sustainable assistance for solid waste disposal site management in Pacific SIDS.

FIELD TRIPS:

The consultant shall contact and visit the South Pacific Regional Environment Programme (SPREP) head office at Apia, Samoa and hold the necessary discussions on this project with SPREP staff, including the JICA expert at SPREP, and collect and review any documentation recommended by SPREP.

The consultant shall also visit the other island-types or demonstrate or have access to current, comprehensive and first hand knowledge of the conditions and issues facing solid waste disposal site management on each island-type in Pacific SIDS.

REPORTS:

The consultant shall provide JICA Australia Office with 1 unbound, 30 bound, and one electronic version (MSWord 97) of the final Guidelines report.

APPENDIX B

PROJECT WORKPLAN

Japan International Cooperation Agency

GUIDELINES FOR SOLID WASTE DISPOSAL SITE MANAGEMENT IN PACIFIC ISLAND COUNTRIES

WORKPLAN

1. BACKGROUND

The management of waste materials is a world wide problem. The small island developing states of the Pacific increasingly share this problem. While Pacific Island Countries (PICs) may differ in terms of topography, climate, population, density, economic development, land use, and geology they share the following features:

- Limited land availability and high population density in urban areas;
- Limited institutional capacity and financial resources;
- Poor waste disposal practices and storage of waste generated;
- Limited scope for recycling and recovery and limited collection and transport services;
- Lack of treatment and disposal facilities for special wastes, and stockpiling of special wastes.

In most PICs waste disposal commonly involves the dumping of rubbish at official and unofficial open dumping sites. These sites have a low initial capital investment and operating costs. However, the environmental and health impacts of such operations are potentially significant, and the lack of monitoring of the dumps and impacts on the surrounding community, land and water is a matter of major concern. It is often argued that existing open dump sites should be closed and controlled landfills constructed in their place. However, in view of the severe technical and financial constraints many PICs face, practical reality is likely to necessitate that attempts must first be made to place a measure of control over open dumping practices and gradually upgrade the sites.

It is in this context that the Government of Japan through the Japan International Cooperation Agency (JICA) wants to develop regional guidelines for the proper management of solid waste disposal facilities in PICs. These guidelines will be used to assist JICA identify appropriate and practical ways to provide effective and sustainable assistance for solid waste disposal site management in PICs.

2. PROJECT OBJECTIVE

The objective of the project is to prepare regional guidelines for the proper management of open landfill sites for solid waste disposal in urban areas in PICs

The guidelines would be used by JICA in Oceania to help select, design and implement more sustainable activities in this field in the future.

3. PROJECT DELIVERABLES

Egis Consulting Australia Pty Ltd (Egis) understand the deliverable's of the project are:

i) An overview of the existing situation in solid waste disposal site management in PICs, including cultural, institutional, legal and financial issues (where able), that:

- identifies and explains the main issues;
- Discusses the options available to PICs to address these issues; and
- Uses specific examples to illustrate points made in the overview

ii) A review of the activities of other donors and regional and international organisations in solid disposal site management in PICs that:

- Identifies the activities of the organisations
- Examines the major issues that these organisations face in providing assistance in this field including issues of sustainability – such as appropriate environmental and safety standards and recurrent cost financing and assets maintenance
- Describes the approach of these organisations to these issues.

iii) A guideline for improving the management of solid waste disposal sites in PICs that addresses the following:

- Landfill design and operation
- Access roads and access to the working face
- Site security
- Site facilities and equipment
- Acceptable waste types and waste acceptance procedures
- Disposal of special wastes
- Management of stormwater, leachate and landfill gas
- Application of cover materials
- Control of dust, litter, noise, vectors / vermin and birds
- Worker health and safety, emergency response and complaints
- Measures that will improve the management of an open dump
- Training, equipment and maintenance requirements

The guidelines shall address the variety of conditions and dump / landfill sites existing in PICs. This includes a large island, a volcanic island, and an atoll island.

The guideline shall include recommendations on realistic ways to provide effective and sustainable assistance to improve solid waste disposal site management in PICs.

4. SCOPE OF WORK

To achieve the project objectives and produce the specified project deliverable's Egis would undertake the following:

7. Project Initiation

   - Conduct a kick off meeting in Sydney with JICA
   - Plan and organise the project including overseas site visits

8. Review existing documentation on solid waste disposal site management in PICs including:

   - Guides for Municipal Solid Waste Management in Pacific Island Countries, Healthy Cities – Healthy Islands Documentation Series No.6, WPRO / WHO, December 1996
   - Waste Management in Small Island Developing States in the South Pacific, UNEP / SPREP, Canberra, May 1997
   - "A Road to Sanitary Landfill", JICA and Ministry of Housing and Local Government, Malaysia, October, 1990
   - "What is the Fukuoka Method?", Yasushi Matsufuji

9. Provide an over view of the existing waste management situation in PICs by undertaking the following:

   - Meetings with JICA, SPREP, relevant Samoan Government agencies, and relevant donor organisations in Apia, Samoa (volcanic island). Egis would also inspect the existing waste disposal site in Apia.
   - Meetings with relevant Fijian Government agencies and relevant donor organisations in Suva, Fiji. Egis would also undertake inspections of solid waste disposal sites in Suva and Lautoka / Nadi and hold discussions with relevant local authorities. It would be beneficial if JICA (Fiji Office) were able to assist Egis organise the meeting and site inspections in Fiji. If this is not possible Egis would utilise John Morrison's contacts at USP to organise the meetings and site inspections and gather other necessary data. Allowance has been made in the budget to pay USP for this assistance.
   - Provide an overview of the current situation in Kiribati by using a post graduate student (Tererei Abeti) who is currently studying at Wollongong University, under John Morrison. Ms Abeti is currently head of the Environmental Unit in the Ministry of Environment & Social Services, Kiribati Government. She is currently on study leave. Ms Abeti would use her contacts to prepare an update on the current situation in regard to the condition and management of solid waste disposal sites. Allowance has been made to pay for Ms Abeti's input, which would be provided through the University of Wollongong. Egis would also obtain supporting

information from staff who have recently worked in Kiribati and from contacts with the current ADB project.

- Providing an overview of the existing waste disposal situation in Tonga (Tongatapu - raised atoll) and plans for establishing a new waste management facility, based on existing knowledge / contacts.

- Identifying, obtaining and reviewing relevant documents and reports on waste management prepared by others eg SKM (SPREP) – 8 APC countries including Vanuatu and the Cook Islands, Golders (AusAID) – Tuvalu.

- Updating the information obtained in the 1997 AusAID review of waste management in the South Pacific by following up contacts in other Pacific Island countries not addressed above ie. Marshall Islands, Federated States of Micronesia. This would involve contact by phone/fax to obtain an update on the current waste management / disposal situation. A checklist / survey would be used to ensure all relevant information is obtained.

Egis have allowed for inputs from social and institutional experts to address cultural, social, institutional, legal, sustainable costs / charges and funding issues.

10. Review and report on the activities of other Donors and regional and international organisations. This would be undertaken via a letter / survey questionnaire plus follow up contact by phone and meetings in country (Fiji, Suva), where able. This would include the following organisations:

- SPREP (including meeting in Samoa)
- AusAID (including meeting in Samoa, Fiji and Kiribati (Optional)
- NZ ODA (including meeting in Samoa and Fiji)
- Canadian Aid (including meeting in Suva, Fiji)
- UNDP (including meeting in Suva, Fiji)
- UNEP (via SPREP)
- WHO (including meeting in Suva, Fiji)
- European Union (EU) (including meeting in Samoa and Fiji)
- ADB (including meeting in Kiribati, if possible – Optional)
- SPC (including meeting in Fiji)
- World Bank
- FAO (including meeting in Samoa)
- Forum Secretariat (including meeting in Fiji)
- SOPAC (including meeting in Fiji)

Egis would provide a written description of the outcomes of the review.

11. Prepare guidelines for improving the management of solid waste disposal sites in PICs. The guidelines would be general in nature but provide realistic and practical advice on progressively upgrading solid waste disposal sites. The guidelines would address the following:

    - Technical issues associated with improving the management of solid waste disposal sites in a progressive manner, including options for:
        - Landfill design and operation
        - Access roads and access to the working face
        - Site security
        - Site facilities and equipment
        - Acceptable waste types and waste acceptance procedures
        - Disposal of special wastes
        - Management of stormwater, leachate and landfill gas
        - Application of cover materials
        - Control of dust, litter, noise, vectors / vermin and birds
        - Worker health and safety, emergency response and complaints
    - Environmental and health issues associated with the existing waste disposal methods and upgrading the operations;
    - Financial / economic issues and implications associated with upgrading the facilities and operations, including recurrent cost financing and assets maintenance;
    - Social and cultural issues / considerations associated with implementing charges for funding waste management services and operations, including comments on the capability of communities to pay for services;
    - Legal and institutional issues;
    - Measures that will substantially improve the management of open dumps;
    - Training, equipment and maintenance requirements.

    The guidelines would address each typical island setting ie. large islands, volcanic islands, atoll islands. Allowance has been made for expert input from a geologist / hydrogeologist on surface water / groundwater issues.

    The guidelines would include a generic landfill management plan that describes proper management of solid waste disposal sites, and which may be adapted to suit the local prevailing conditions at PICs.

The guidelines would also include recommendations on:

- realistic ways to provide effective and sustainable assistance for solid waste disposal site management in PICs
- recurrent cost financing;
- appropriate technology;
- appropriate environmental goals / standards;
- measures to improve the management of open dumps;
- training, equipment and maintenance;
- the broader issue of integrated waste management including options for waste minimisation and recycling.

Allowance has been made to prepare a Draft Guideline (2 copies) for review by JICA and then a meeting to review and discuss the Draft Guidelines.

The final Guidelines would incorporate feedback obtained from JICA. Allowance has been made to provide 1 unbound, 2 bound copies, and an electronic version (MSWord 97) of the final guidelines.

5. PROJECT TEAM

For this project Egis would utilise the following personnel:

Project Director – Mr David Russell

Project Manager / Waste Management Specialist and Landfill Engineer– Mr Stuart Dever

Pacific Island Specialist Adviser / Environmental Adviser – Dr John Morrison, University of Wollongong

Environmental Engineer – Ms Emma Every

Geologist / Hydrogeologist – Mr Philip Burris

Graduate Environmental Engineer – Ms Sarah Kim

Clinical Waste Management Specialist – Mr Paul Clarey

Institutional / Legal Specialist – Carolyn Marsh (MDG)

Social / Cultural Specialist – Carolyn Marsh (MDG)

Kiribati Environmental Adviser – Ms Tererei Abeti

6. PROGRAM

The proposed program for the project is shown in the attached Table. In accordance with JICA's requirements all field work are programmed to completed before the end of March 2001 and a Draft Report to be presented to JICA by the end of April 2001. Please note that this is a very tight program particularly considering that Easter falls in the middle of April 2001. Egis will however endeavour to meet this program. Should events occur which delay the project Egis would advise JICA as soon as practical.

APPENDIX C
ORGANISATIONS / PERSONS MET

Organisations / Persons Met

Date	Time	Organisation, Contact
14/3/01	10.00am	**JICA, Samoa** Mr Mimura, Assistant Resident Representative
14/3/01	2.00pm	**SPREP** Shiro Amano, Project Officer, Landfill Management Dr. Bruce Graham, Coordinator Waste Management and Pollution Prevention
15/3/01	8.30am	**AusAid** Ed Peek, Development Cooperation
15/3/01	10.00am	**WHO, Samoa Office** Anne Wood, Program Management Officer
15/3/01	11.00am	**Government of Samoa, Treasury Department** Iulai Lavea, Deputy Financial Secretary (Economics and Finance)
15/3/01	2.00pm	**Government of Samoa Division of Environment and Conservation (DEC), Department of Land, Survey and Environment** Laavasa Malua, Senior Environmental Planner
16/3/01	10.30am	**NZODA** Craig Hawke, Deputy High Commissioner
16/3/01	11.30am	**FAO (Food And Agricultural Organisation of the United Nations)** Matairangi Purea, Plant Protection Officer, Sub Regional office for the Pacific (SAPA)
16/3/01	2.00pm	**European Union** Stephen Rogers, Head of Office, Delegation of the European Commission for the Pacific Enrico Strampelli
16/3/01	2.30pm	**UNDP (United Nations Development Program)** Tom Twining Ward, Environment Adviser
19/3/01	9.00pm	**JICA, Fiji** **Tadanori Suzuki, Resident Representative** Hiroyuki Sawada, Assistant Resident Representative Mosese Waqa, Research Associate
19/3/01	2.00pm	**Suva City Council, Lami Dump visit** Bajay Chand, Senior Health Inspector Operations
19/3/01	3.00pm	**SPC Secretariat of the Pacific Community** Thomas Osborn, Agricultural Adviser

Date	Time	Organisation, Contact
20/3/01	10.00am	**Meeting Attendees**
		JICA (As above)
		SOPAC (South Pacific Applied Geoscience Commission) Craig Pratt, Environmental Scientist
		UNDP (United Nations Development Programme) Dr Jenny Bryant-Takalu, GEF Technical Adviser and Head, GEF Unit
		AusAid, Fiji Geoff Adlide, First Secretary (Development Cooperation)
		European Union Guido Carrara, Rural Development Adviser
		WHO, Fiji Dr Donald Sharp, Environmental Engineer
		USP Prof. William G.L. (Bill) Aalbersberg, Director
		Suva City Council Nacanieli Kotoiwasawasa, Director of Health
20/3/01	3.00pm	**Department of Environment, Fiji** Epeli Nasome, Director of Environment
22/3/01	8.00am	**NZODA, Fiji** Nicky McDonald, First Secretary
	10.00am	**Hydroplan, Fiji** Peter Heckel, Regional Manager
23/3/01	8.30am	**Lautoka City Council** Rajendra Pratap, Director Health Services
23/3/01	10.30am	**FSC (Fiji Sugar Corporation)** William P. Thaggard, Manager, Occupational Health and Safety
23/3/01	2.00pm	**Nadi Town Council** Robin K. Ali, Town Clerk / CEO

APPENDIX D
LIST OF CONTACTS

List of Contacts

Organisation	Address details	Contact	Email Address
JICA, Samoa	JICA Samoa Office Mulivai, Apia Samoa Tel: 685 22572, 22139 Fax: 685 22914 Email: jicasm@jica.go.sp	Mr Mimura Assistant Resident Representative	Mimura@jica.gov.jp
SPREP	SPREP Tel: 685 21929 Fax 685 20231 PO Box 240, Apia, Samoa	Shiro Amano Project Officer, Landfill Management	shiro@sprep.org.ws
		Dr. Bruce Graham Coordinator Waste Management and Pollution Prevention	BruceG@sprep.org.ws
AusAid	AusAid Samoa Office Beach Road, Apia, Samoa Tel: 685 23411 Fax:685 26872	Ed Peek Development Cooperation	Ed_peek@ausaid.gov.au
WHO	WHO, Samoa Office PO Box 77 Apia, Samoa Tel: 685 23756, 23757 Fax: 685 23765	Anne Wood Program Management Officer	Anne@who.org.ws
Government of Samoa, Treasury Department	Treasury Department Private Bag Apia Samoa Tel: 685 34333, 34344 Fax: 685 21312	Iulai Lavea Deputy Financial Secretary (Economics and Finance)	Ilavea@samoa.ws
Government of Samoa	Division of Environment and Conservation (DEC) Department of Land, Survey and Environment Private Bag Apia Samoa	Laavasa Malua Senior Environmental Planner	

Organisation	Address details	Contact	Email Address
NZODA	New Zealand High Commission PO Box 1876 Apia, Samoa Tel: 685 21711 Fax: 685 20086	Craig Hawke Deputy High Commissioner	Craig.hawke@mfat.govt.nz
FAO	Food And Agricultural Organisation of the United Nations (FAO) Private Mail Bag Apia, Samoa Tel: 685 221227 Fax: 685 22126	Matairangi Purea Plant Protection Officer Sub Regional office for the Pacific (SAPA)	Mat.purea@field.fao.org
European Union	European Union PO Box 2023, Apia, Samoa Tel:685 20020 Fax: 685 24622	Stephen Rogers Head of Office Delegation of the European Commission for the Pacific	Stephen.rogers@delwsm.cec.eu.int
		Enrico Strampelli	
UNDP	United Nations Development Program Private Mail Bag, Apia, Samoa Tel: 685 23670, 23671, 23672 Fax: 685 23555 www.undp.org.ws	Tom Twining Ward Environment Adviser	Tom.twining-ward@undp.org
JICA	JICA 7th Floor Dominion House JICA Private Mail Bag, Suva, Fiji Tel: 679 302522 Fax: 679 302452	Tadanori Suzuki Resident Representative Hiroyuki Sawada Assistant Resident Representative Mosese Waqa Research Associate Bimla Khan Programme Officer	Email: jica@is.com.fj

Organisation	Address details	Contact	Email Address
SPC	Secretariat of the Pacific Community Private Mail Bag, Suva, Fiji Tel: 679 370733 Fax: 679 370021 www.spc.int	Thomas Osborn Agricultural Adviser	Tomo@spc.int
SOPAC	South Pacific Applied Geoscience Commission (SOPAC) SOPAC Secretariat Private Mail Bag, GPO, Suva, Fiji Tel: 679 381377 Fax: 679 370040 www.sopac.org.fj/evi	Craig Pratt Environmental Scientist	Craig@sopac.org.fj
UNDP	United Nations Development Programme 3rd Floor, ANZ House Suva, Fiji Private mail Bag, Suva, Fiji Tel: 679 312500 Fax: 679 301718 www.gefpacific.org	Dr Jenny Bryant-Takalu GEF Technical Adviser and Head, GEF Unit	Jenny.bryant@undp.org
AusAid	Australian High Commission 37 Princes Road, Tamavua, Suva, Fiji PO Box 214, Suva, Fiji Tel: 679 382475 Fax: 679 382695	Geoff Adlide First Secretary (Development Cooperation)	Geoff.adlide@dfat.gov.au
European Union	European Union Delegaton of the European Commission for the Pacific 4th Floor, FDB Building, Suva Private Mail Bag, GPO, Suva, Fiji Tel: 679 313633 Fax: 679 300370	Guido Carrara Rural Development Adviser	Eudelfiji@eu.org.fj

Organisation	Address details	Contact	Email Address
WHO	World Health Organisation Level 4, Provident Plaza One Downtown Boulevard 33 Ellery Street, Suva, Fiji PO Box 113 Tel: 679 304600 Fax: 679 300462	Dr Donald Sharp Environmental Engineer	Sharpd@fiji.wpro.who.int
USP	The University of the South Pacific Institute of Applied Sciences PO Box 1168 Suva, Fiji Tel: 312952, 313900 ext. 2440, 2245 Fax: 300373	Prof. William G.L. (Bill) Aalbersberg Director	Aalbersberg@usp.ac.fj
Suva City Council	Suva City Council PO Box 176 Suva, Fiji Tel: 313433 Fax: 302158	Bajay Chand Senior Health Inspector Operations Tel: 313433 ext. 404 Mob: 908602	
		Nacanieli Kotoiwasawasa Director of Health	
Department of Environment	Department of Environment 3rd Floor, Fiji Football Association House, Gladstone road, Suva, Fiji PO Box 2131 Government Buildings, Suva Fiji Tel: 679 311699 Fax 679 312 879	Epeli Nasome Director of Environment	Enasome@govnet.gov.fj
NZODA	New Zealand High Commission Reserve Bank Building, Pratt Street PO Box 1378, Suva, Fiji Tel: 679 311422 Fax: 679 300842	Nicky McDonald First Secretary	Nicky.mcdonald@mfat.govt.nz

Organisation	Address details	Contact	Email Address
Hydroplan	Suva, Fiji Tel: 309 145 Fax: 308 875 Mob: 952 131	Peter Heckel Regional Manager	Nlp@is.com.fj
Lautoka City Council	Lautoka City Council 14 Chenab Place Rifle Range, Lautoka PO Box 124, Lautoka, Fiji Tel: 679 660433 Fax: 679 663 288	Rajendra Pratap Director Health Services	
FSC	Fiji Sugar Corporation Head Office, Western House Private Mail Bag Lautoka, Fiji Tel: 679 662655 Fax: 679 664685	William P. Thaggard Manager, Occupational Health and Safety	
Nadi Town Council	Nadi Town Council PO Box 241, Nadi Tel: 679 700133, 700503 Fax 679 701202	Robin K. Ali Town Clerk / CEO	Robin_ntc@hotmail.com
NZODA	NZODA Direct Line: +64-4-494 8255 Fax: +64-4-494 8515	Keneti Faulalo, PhD. Programme Manager - Multilateral/Pacific Regional Environment, CGIAR	Email: keneti.faulalo@mfat.govt.nz
Ministry of Finance Office for International Development Assistance, in the RMI		Carl Hacker	

APPENDIX E
COUNTRY REPORTS
EXISTING WASTE MANAGEMENT SITUATION

Japan International Cooperation Agency

GUIDELINES FOR SOLID WASTE DISPOSAL SITE MANAGEMENT IN PACIFIC ISLAND COUNTRIES

COUNTRY REPORT ON URBAN SOLID WASTE MANAGEMENT

Fiji

1. WASTE MANAGEMENT POLICY AND PLAN

None available

2. RELEVANT LEGISLATION, REGULATIONS, AND GUIDELINES

None discussed. Generally falls under Council by-laws

3. CURRENT SOLID WASTE MANAGEMENT PRACTICES - SUVA

3.1 Waste Generation

A weighbridge is available at the Lami Dump (operated by Suva City Council). The weighbridge operates by weighing one axle at a time. It is not currently operating and we were advised that it is not very accurate

In 1995 Suva City Council received 12,900 T from 81,000 people (equivalent to 0.16 T/person per year or 0.44kg/person per day). It is noted that this seems low.

3.2 Littering and Indiscriminate Dumping of Waste?

There is no detail relating the to occurrence / prevalence of waste dumping and littering. Some anti litter signs are posted about as a form of management / control measures

3.3 Waste Minimisation Activities

Garden waste is collected separately in Suva but is treated as landfill anyway. The council is investigating the purchase of a mobile shredder ($300,000) for processing the garden waste.

White goods are separated at the Lami dump but also landfilled, despite the scrap metal opportunities with the presence of a steel mill. The SKM report indicated that there are three scrap metal businesses in Lautoka and so presumably there are also businesses in the Suva area although no details are known

Paper and cardboard recycling is undertaken in Lautoka and transported to Suva for baling and shipping to Australia.

3.4 Waste Storage

DOE advised that waste receptacles at residential premises and commercial premises were as desired by the householder. This is covered by some by-laws (council regulations).

3.5 Waste Collection

Waste is collected from residential, institutional, commercial and industrial premises by the local government (Suva City Council, Lami Council and others). They collect all "domestic" garbage from all premises including a daily pickup from the CBD. Residential collection occurs 3 times per week (very frequent!). This is done by council vehicles and staff. Additional commercial and industrial waste is collected by the private sector under private arrangements (eg. a new company Waste Care, a New Zealand company and Carpenters). The

private sector also collects green waste from properties once per week as well as street sweeping, drain cleaning material. Funding for these activities is obtained via property rates (based on land value) although the Council is planning to have a separate charge that will result in a higher cost for commercial and industrial premises.

3.6 Waste Disposal

The waste disposal site for the greater Suva area (population greater than 100,000) is the Lami waste disposal site. The Lami dump is located in a former mangrove area at the southern end of Suva Harbour. Access to the site is very poor (see photos) due to the condition of the road, particularly in wet weather.

There is a site gatehouse / office with amenities available including power and water. The telephone (broken at the time of visit) was located near the entrance to the dump. A weighbridge is also located at the front of the site gatehouse. The weighbridge uses a single axle method and is not considered to be very accurate and was not working at the time of the visit. It was noted that the weighbridge cost some $300,000 to install, which seems very expensive for an inferior weighbridge. The recording of waste types, quantities, vehicles etc is therefore undertaken.

Other facilities at the site include a truck wash which all users must pay a fee to use.

The site is reasonably elevated with respect to surrounding land due to a long history of filling. The landfilling operation consists of above ground landfilling, forming mountain. It is understood that underlying the dump is a tidal mangrove with marine sediments / mud

Equipment used at the site includes a D6 dozer, which is Council owned and is approximately 10 years old. A sheep's foot roller owned and operated by a contractor is also used. The funds for the roller are just about to run out, however they may get a digger, as this is more important. There is some discussion as to whether Suva Council's equipment will be bought out for use at the new landfill. No one supplies dedicated landfill compactors in Fiji. The Council does have their own maintenance facility to ensure the proper operation and maintenance of Council equipment.

The sheep's foot roller and the dozer do the compaction and covering of the waste. Recently, daily covering of waste was commenced. Some $80,000 was provided by government to improve landfill by covering waste. Only newly landfilled areas are being covered. Other areas have not yet been covered as they are too large and there are not sufficient funds.

Essentially all wastes are disposed of on site although commercial food processing waste is buried immediately. No septage waste, sludges only. The facility is not supposed to accept hazardous wastes but no other provision has been made. In theory, people are supposed to apply to dump the hazardous material, which only happens occasionally. Commonly, hazardous material is mixed in with other wastes. There is separate management of garden waste undertaken and this material is only landfilled. Medical waste is incinerated.

Site management, supervision and staffing comprises four staff. Staff responsibilities include keeping scavengers away, as there is no site fencing or security. However, scavenging was recently stopped after a child was run over by a bull dozer and killed.

Little or no controls exist at the site with respect to discharges and environmental impacts. No formal stormwater management occurs with all the stormwater draining into the harbour. This is done to minimise flooding and maintain access to the site. Similarly, no leachate management is undertaken with all leachate also draining into the harbour. Fire controls are not available and no environmental monitoring program is undertaken.

It was advised that recent measures to control flies and odour have been about 80% effective. (Site observations did not strongly agree with this). Most of the waste is uncovered and there is a large ferret/mongoose population.

Most problems related to the lack of cover over the waste. This must be purchased or obtained from Council roadworks and is very costly. Most areas of the site are uncovered.

Proposal for closure and rehabilitation of the site has not yet been done but will be difficult and very costly. There are plans for the Lami dump to be rehabilitated as part of the EU project.

The Nausori dump was closed prior to the coup by the former government. Rehabilitation of this site forms part of the EU project.

3.7 Management of Special Wastes

Medical and clinical wastes in the Suva area are generally incinerated at hospitals.

Septage is delivered to the sewage treatment works operated by Public Works. Sludges are disposed of at the dump (refer to Section 4.6).

Waste oil is collected by the steel mill for use as a fuel.

Quarantine waste is incinerated and this is managed by quarantine service

Hazardous waste is generally landfilled.

4. CURRENT SOLID WASTE MANAGEMENT PRACTICES – NADI/LAUTOKA

4.1 Waste Generation

The SKM study indicated that for the Lautoka landfill (as utilised by Nadi and Lautoka), the waste generation rate was in the order of 0.92 kg/person/day with a total population in the order of 60,0000 (Lautoka – 46,000, Nadi – 14,000)

4.2 Littering and Indiscriminate Dumping of Waste?

The littering and dumping of waste is not generally recognised as a significant problem. However, the Lautoka Council noted that there are a number of campaigns including "Do The Right Thing" and the Keep Fiji Beautiful Association (sponsored by Coca Cola). A newsletter has been delivered to every household/premise to discourage littering.

4.3 Waste Minimisation Activities

Few waste minimisation activities are undertaken, although it is noted that PET recycling and Aluminium can recycling is undertaken. Scavengers at the landfill are mostly responsible for this. Furthermore there is CDL on 1Litre glass soft drink (coca-cola) bottles of 10c. Lautoka Council has plans to use composting/vermiculture to reduce green waste. This is being undertaken by Mammorth Investments Ltd. Some stockpiles of green waste were noted at the dump but these were not shredded.

Nadi council encourages waste minimisation through newsletters and school programs and also encourage home composting. Council has no formal waste minimisation programs other than the awareness program

4.4 Waste Storage

No specific requirements.

4.5 Waste Collection

Lautoka Council has been employing the same local contractor for waste services for the past 15 years. The service has been reliable and has recently been extended for a 5 year period. The contractor has 4 new compactor trucks and services commercial premises, schools and institutional premises 6 days/week. Residential premises are serviced twice a week. The cost of this service is some $105,000/yr to service 46,000 people.

In Nadi, a private contractor also collects waste. With a new contractor recently winning a 3 year contract. Residential premises (population of 14,000) are serviced 3 days/week while other premises are serviced 6 days/ week. Only domestic garbage is collected with garden waste being collected by a separate contractor once every 2 months. The contractor has a 1.5 hour return trip to the Lautoka Dump and back.

4.6 Waste Disposal

The Lautoka waste disposal site receives garbage from both Lautoka and Nadi (total population approximately 60,000) and it is located in an old mangrove area. The total site covers an area of some 50ha with some 10ha currently already filled (sufficient space exists for another approx 15 – 20 years).

Access to the site is poor due to the condition of the road. Furthermore the road is through native land which sometimes provides access difficulties. The council is negotiating a proper lease.

A site gatehouse, which includes an office with amenities (power and water), is located at the entrance to the site. All vehicles are charged between FJ3.50 and FJ30.00 (with vehicles from outside the city being charged extra). Detailed recording of waste types, quantities and vehicles is undertaken by site staff with reporting of the gate takings done daily.

The landfilling operation is an area fill type with a D6 dozer employed on the site. A compactor is used only in dry weather and is hired by council @ $55/hr.

Compaction and covering of waste is generally undertaken once per month when the contractors machine is available. Approximately 1000m^3 of cover at $4/$m^3$ is used. The Lautoka dump has much better sanitary conditions that Lami dump. Basically all waste types are disposed of on site, although no septage is accepted. This is regulated by the gatekeeper. Site management, supervision and staffing undertaken by a gatekeeper ($3.00/hr).

Site security (fencing) does not exist, although there is a lockable gate at the site

Stormwater management consists of some drainage channels that discharge into the ocean. These appear highly polluted. No leachate management is undertaken with all leachate believed to drain into the harbour. While cover material is applied, there were many birds and mongoose observed.

Generally, a daily public health inspection is undertaken.

Separate management of garden waste is undertaken as they are starting to commence a composting operation.

No special measures are undertaken for special wastes – these wastes are just mixed in with other wastes.

4.7 Management of Special Wastes

Special wastes are managed as follows:

- Medical and clinical wastes are incinerated.
- No septage is disposed of at the landfill as it is delivered to the sewage treatment works operated by Public Works (95% of Suva is sewered).
- Waste oil is not allowed in dump and is collected by the steel mill for use as a fuel.
- Quarantine waste is incinerated at the airport.

5. FUNDING OF WASTE MANAGEMENT

The cost of providing waste collection services is approximately $500,000 per annum. Recently there was a 20% reduction in the budget for landfill. The Lami dump was established in 1945, so the costs of establishing the waste disposal site are not known.

The primary mechanism used for funding waste management activities is through the collection of property rates. Fees are also charged for waste disposal at the landfill site. This includes waste delivered by other councils, cars and private sector vehicles.

No funding is allocated for environmental monitoring.

No funding has been allocated for the closure and rehabilitation of the site although it is considered that this will be very expensive due to size of Lami dump site. Staff anticipates that this will be undertaken and funded by EU.

6. RELEVANT GOVERNMENT AGENCIES

Relevant Government agencies and departments involved in waste management, including a definition of their roles and responsibilities, are as follows:

- Department of Environment – somewhat regulatory (through other government departments) but mostly play an advisory role. It is heavily involved in the establishment of the new landfill facility.
- Suva City Council – undertake waste collection and operation of Lami dump. Other local governments in Suva area also undertake waste collection and deposit at Lami dump.
- Lautoka City Council - undertake waste collection and operation of Lautoka dump. The Nadi City council undertake waste collection and deposit at Lautoka dump
- Private sector – undertake waste collection of additional waste from commercial / industrial type sectors

The roles of these parties may change as part of the EU project as a new company may undertake waste collection and disposal from regional waste transfer stations (councils collect waste and deposit at transfer stations – transfer stations operated by landfill company).

7. SOURCES OF INFORMATION

- Discussions with various agencies in Fiji – see reports in Appendix G
- Site inspections undertaken during this Project
- SKM, Solid Waste Characterisation and Management Plan, Fiji, 1999

8. CONTACTS FOR FURTHER INFORMATION:

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Name: Rajendra Pratap

Agency / Position: Director Health Services, Lautoka City Council

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Name: Robin K. Ali

Agency / Position: Town Clerk, Nadi City Council

Tel: (679) 700133 / 700503

9. OTHER

The Senior Health inspector recently (last October / November) attended a garden waste conference in Coffs Harbour. The Senior Health inspector will also going to Coffs Harbour Waste Conference next month (April 2001).

Japan International Cooperation Agency

GUIDELINES FOR SOLID WASTE DISPOSAL SITE MANAGEMENT IN PACIFIC ISLAND COUNTRIES

COUNTRY REPORT ON URBAN SOLID WASTE MANAGEMENT

Apia, Samoa

1. WASTE MANAGEMENT POLICY AND PLAN

A National Waste Management Policy has been developed by the Samoan government but is still being finalised. This is a policy document outlining goals and objectives. The document is expected to go to Cabinet in the short term for approval (currently confidential). Following approval, it is intended that a Solid Waste Management Plan will be prepared (timing not provided).

A Landfill Management Plan has been prepared for the Tafaigata Landfill at Lafi. The document details current operations and problems at the landfill and outlines a proposed management strategy. The DEC advised that this plan was introduced some time ago.

2. RELEVANT LEGISLATION, REGULATIONS, AND GUIDELINES

No specific relevant legislation, regulations or guidelines apply to waste management sites except as outlined above.

Issues with respect to air pollution (eg in the case of an incinerator) are the responsibility of the Department of Health although DEC is trying to get involved and adopt responsibility.

3. CURRENT SOLID WASTE MANAGEMENT PRACTICES

3.1 Waste Generation

A waste audit undertaken by SKM in December 1999 indicated that waste generation rates were in the order of 0.98kg/person/day. The audit was undertaken for the household collection service over a period of 9 days and involved some 36 households and small businesses (no large industry involved).

A waste characterisation study conducted in Apia in 1993 by the DEC and SPREP had a waste generation rate of 0.52kg/person/day with a bulk density of 350kg/m^3. Of the total waste stream some 59% (weight basis) was biodegradable.

3.2 Littering and Indiscriminate Dumping of Waste

DEC discourages littering through a reporting program whereby residents are encouraged to report litterers. The program was promoted through advertising and encouraging proper waste management. The program seems to be working well although people are still dumping. It is possible for the DEC to issue an on the spot fine ($100 WST) although this has not been done yet. The DEC prefer to issue a letter requesting a clean up otherwise they will be fined. This approach has been working well and most people clean up their mess. The DEC can prosecute for more serious cases.

SPREP have also been involved in activities in this area including involvement in a TV commercial, distribution of pamphlets and other programs.

3.3 Waste Minimisation Activities

Waste minimisation and recycling activities undertaken in Samoa include:

- Biogas project which is being considered by the Director of DEC. Refer to NZODA Organisation report (Appendix E) for further details.
- Extensive composting operations – there are 2 "organic" farms utilising the material although most farmers are generally not interested. A women in business group is also promoting composting
- There is still only small scale metal recycling being undertaken by the private sector
- Vailima Brewery has CDL on its' bottles with a container return rate of some 95%

SPREP have been involved in waste management awareness and waste minimisation (composting, introduction of a charging system) as part of a total education program for waste management in Samoa.

The SKM report (see references) indicated that Samoa used to tax 50 sene per container for all imported carbonated drinks in cans, PET bottles etc. It is now 30 sene for every imported container with 10 sene per container reimbursed (if the importer has shown the government that it has re-exported the containers).

3.4 Waste Storage

Waste is stored at most premises in ½ steel drums on stands. This isn't standardised and there are a mixture of stands, ½ drums and some bins.

3.5 Waste Collection

Waste collection is undertaken by a contractor (recently engaged a new contractor – refer to details below). Currently a restricted area around the CBD plus 2 outer zones have a waste collection service that involves two collections each week. Costs for the service total some $300,000/year for the 3 zones.

It was advised that a country wide collection service was introduced in May 2001. This will be for non-organic wastes and no bulky wastes will be permitted. Collection for the remainder of the areas will amount to less than $200,000/year.

The collection service will be provided at no charge to residents as this is considered the most fair system and charging would be too difficult.

2 contractors are undertaking the current collection service – one for the CBD and one servicing the 2 outer zones. There were over 10 tenderers for these contracts.

The DEC has advised contractors not to utilise compactor trucks as they may want to encourage separate collection at a later date.

Each of the collection trucks is fitted with nets to prevent windblown litter (this is a government requirement).

For the remainder of the country it is intended that Suavi'i will be divided into 2 zones and the remainder of Upolu will be divided into 3 zones.

3.6 Waste Disposal

The Tafa'igata Landfill services the main island of Upolu. In Suvai'i, 3 possible sites are being considered with sizes of 100acres, 44 acres and 7 acres. The smallest site is acting as an interim facility only and was an existing quarry. An EIA did not assess this site as desirable as the site lies within a catchment area

Site access to the Tafaigata site is poor due to the poor condition of the road. There is no plan to seal the road, as this is considered too costly. Currently the road is repaired every 3 years.

A reasonably new site gate-house/office (with amenities) is in place at the site. Site services include water, power, and septic tank. Recording of waste types, quantities and vehicles is currently undertaken in conjunction with the introduction of a new charging system. Site management, supervision and staffing includes 3 staff, 1 site manager and a night watchman

Wastes appear to be placed fairly haphazardly in the landfilling operation although there is a designated area for medical wastes (septage and hospital wastes are placed in dedicated pits). All types of waste disposed of at the site and there is no separate management of garden waste as loads come in mixed (when it is collected).

Equipment used on site includes a contractor-operated bulldozer and excavator. This is undertaken as required (generally about 1 –2 weeks per month)

The landfill site is not fenced and has no stormwater or leachate management systems in place. Furthermore there are no environmental control measures or fire control measures.

A large number of dogs were seen at the landfill during the inspection

There are no plans proposed for the closure and rehabilitation of the site and there is no formal planning to improve operations at the dumpsite. This will require increased funding.

It was noted that the budget of $200,000/yr does not provide sufficient funds for the dump to operate as a sanitary landfill (bulldozer costs are in the order of $8000 - $9000 per week). Although the DEC do have a long term plan to potentially engage a contractor to operate the landfill sites.

3.7 Management of Special Wastes

Special wastes on Upolu are managed as follows:

- Medical / clinical waste is placed in a dedicated pit at the dumpsite. The pit is open for 3 – 6 months before being covered.
- Sludges / septage are also placed in simple pits at dumpsite. This totals some 3 – 4 loads per day at $30 WST per load
- Waste oil was sent to a recycled oil facility but this closed down due to lack of support. Some discussions about reopening the facility are current.
- Quarantine waste is disposed of via two incinerators which operate in Samoa – one is located at the port and one at the airport

The government has been pursuing a waste incinerator for health care wastes. A proposal has been prepared which includes the design; EIA, equipment and training. The system is being pursued by the hospital in conjunction with the Department of Health. DEC believe that JICA are concerned about incineration as a means of treating medical waste. This concern is due to emissions from such a facility and also from the recommendations from the SPREP POPs study. The study recommended that incineration not be used and that autoclaving was preferred.

The Quarantine unit advised that they would not be happy with disposal of medical waste at their quarantine incinerators as these incinerators are too small and are manually loaded.

4. FUNDING OF WASTE MANAGEMENT

Waste collection services costs are worn by the government ie Central Revenue. (See also Section 4.5). This is also the source of funds (where available) for paying for waste management services / activities, equipment, waste disposal site and any other infrastructure Government funding is derived from income tax, 10% GST, import tariffs and corporate tax. The costs of establishing and operating the waste disposal site are approximately $200,000/yr.

Other mechanisms used for recovering costs include fees for waste disposal at the dumpsite (although revenue has not been reviewed yet). No specific mechanism exists for recovering costs for waste collection.

No funding is allocated for environmental monitoring and no funding has yet been allocated for closure and rehabilitation of the site. (Landfill may have up to 120 years life)

A charging system has recently been introduced at the landfilled (September 2000). Charges range from $5 WST for a car to $75 WST for a container load. Refer to charges attached. The total monies collected have not been reviewed as they are awaiting the end of the financial year to undertake this. When the collected monies are tallied, a review of the upgrade cost of the landfill will be undertaken.

It is considered that there is insufficient funds for maintaining sanitary landfill conditions (not the way the landfill is currently run). DEC have not determined what funding is required to achieve sanitary conditions. The currently operate the depot as best they can within the available budget/money

Any funds collected by DLSE (DEC) must be declared and returned to central revenue and it may not be passed back to DLSE.

It is noted that a health levy on tobacco and alcohol is in place so this could be extended to cover a waste levy. To increase any charges, the Treasury Department advised that it would be necessary to undertake a comprehensive education program (similar to that undertaken when water charges were introduced).

If waste services were billed to the public, then the Treasury Department has a preference that a separate body (eg local council) is set up to undertake this activity as well as responsibility for other services such as roads.

The Treasury Department has allowed in the budget for a potential surcharge on the sale of plastic goods although this has yet to be implemented (even though the cabinet has passed it). It was indicated that approximately 80% of people could afford to pay waste disposal charges in the order of $5 WST/month

5. RELEVANT GOVERNMENT AGENCIES

Relevant Government agencies and personnel involved in waste management includes:

- DEC – Division of Environment and Conservation – act as both the waste service provider and regulator (ie. conflict of interest)
  - Vainuupo Jungblut – Overall manager (primarily) of landfill waste depot but is being transferred to another government department
  - Lavassa Malua (DEC) – Senior Environmental Planning Officer
- Ministry of Health – Medical wastes
- Ministry of Works – septic wastes

6. SOURCES OF INFORMATION

- Interviews with relevant government personnel in Apia, Samoa, 2001, including the DEC
- Inspection of the Tafa'igata Landfill site, March 2001
- Tafa'igata Landfill Management Plan, prepared by the DEC (with assistance of JICA expert), Undated
- SKM, Solid Waste Characterisation and Management Plan, Samoa, 1999
- Dever S. & Morrison J., AusAID Pacific Regional Waste Study, Samoa Country Report

- Egis Consulting Aust, Project Identification Study on Waste Management in Samoa, 1998

7. CONTACTS FOR FURTHER INFORMATION:

Name: Mr Laavasa Malua

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Department of Land, Survey and Environment

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8. OTHER

DEC is currently severely short staffed (2 staff instead of usual 5)

The SKM report undertook a ranking of waste management options against criteria with the following being the top 3 ranked options:

1. Education program
2. Glass recycling to supplier
3. Media campaign / metal recycling

Japan International Cooperation Agency

GUIDELINES FOR SOLID WASTE DISPOSAL SITE MANAGEMENT IN PACIFIC ISLAND COUNTRIES

COUNTRY REPORT ON URBAN SOLID WASTE MANAGEMENT

Funafuti, Tuvalu

1. WASTE MANAGEMENT POLICY AND PLAN

There are a number of relevant documents relating to waste management and planning in Tuvalu as follows:

- 1996: ADB funded a project for "Urban Planning and Environmental Management Study". Saw considerable room for improving the solid waste management in Funafuti (Capital) and Vaitapu (main urban area) and recommended a Solid Waste Management Improvement Scheme for both at a cost of US$340,200 and US$205,800 respectively. Specific recommendation was for educational and awareness programs;

- 1998: SOPAC and Opus International Consultants concentrating on the development of a Solid Waste Management Plan for Funafuti. The plan recommended a Solid Waste Management Workshop to facilitate the implementation of the plan, a waste characterisation survey, setting of waste reduction targets and development of educational awareness programs;

- 1999: SPREP's report on the Solid Waste Characterisation Study and Management Plan includes an Integrated Solid Waste Management Plan which addresses: Waste minimisation; Refuse collection; Disposal of refuse to the landfill; Special wastes; Community involvement; Organisation of solid waste management; and Implementing the plan. This plan is the most recent and comprehensive study conducted in Tuvalu. However, the Tuvalu Government has not adopted it.

- Late 1998 to present: AusAID was approached by the Tuvalu Government to provide assistance with the design of comprehensive waste management program (approximately AUS$3million). Golder Associates has been conducting pilot studies for solid waste management (collection system, disposal system and composting) and sewage collection and disposal system (household sewage, public toilets and pig wastes).

2. RELEVANT LEGISLATION, REGULATIONS, AND GUIDELINES

The only legislation for solid waste management in Tuvalu is the Funafuti Town Council Garbage Disposal By-Law that prohibits the disposal of municipal solid waste into an area other than the designated dumping site. Fines are AUS$100 or six months in prison. However, there is a lack of enforcement of this law.

The Public Health Act and Regulation (1926) states that all premises and land should be kept clean through burning or placing of rubbish in bins.

The new Marine Act 1991 covers the dumping or the discharge of pollutants and waste into the marine environment, but it lacks precise definition of types of pollutants and ways these materials are likely to reach the marine environment.

The need was highlighted in the past reports (specified above) of developing specific legislation covering waste minimisation and waste disposal and the proper environmental assessment of landfill sites.

3. CURRENT SOLID WASTE MANAGEMENT PRACTICES

3.1 Waste Generation

A solid waste management study conducted in 1996 by Mataio Tekinene quotes 9kg / house / day or 1.2kg / person / day, which is similar to the waste generation rate of Suva City, Fiji (SKM, 1999). The author mentions that the figure is relatively high as the survey coincided with a feast on Funafuti.

A limited waste audit / survey and characterisation (20 households at Vaiaku on 8 consecutive days) was undertaken by SKM for SPREP. (Solid Waste Characterisation Study and Management Plan). The analysis shows the following:

- Bulk density of waste = 169kg/m^3
- Waste generation of household = 3kg / house / day or 0.43kg / person / day
- For Funafuti in 1 year = 722 tonnes / year
- Total volume of waste = 4,278m^3/year
- If compacted = 2,139m^3/year (approximately half the original volume)
- If organics were composted = 1,069 m^3/year (approximately quarter the original volume)
- If waste minimisation and recycling program reduced waste components such as metals, glass, paper and plastics (reduced by at least 25%) = approx. 800 m^3/year

3.2 Littering and Indiscriminate Dumping of Waste?

The Funafuti Council has records of public dumping waste indiscriminately around villages, roads, beaches and vacant land. It is believed that some businesses that do not have their waste collected by the Council are illegally dumping waste outside the designated dumping areas.

3.3 Waste Minimisation Activities

Education programs

All previous studies have recommended the importance of community based education and awareness for improving the management of solid waste in Tuvalu, but lack of funds are a recognised problem. At present there is very little education on solid waste management or environmental management carried out at any level in the community.

A public education program such as 'Clean up the World Week' (Pers. Com. Alan Boase, 2001) exist and have been conducted on the island recently.

Local waste materials re-use eg. returnable bottles

Composting or organic waste from household may be feasible in Funafuti as it produces valuable product that can minimise expensive fertilisers and considerably reduce waste disposed to the landfill. There may be approximately 90m^3/year of compost produced for use. It was recommended by the SPREP study that composting to be carried out in small scale initially to ascertain the best operating parameters.

Recycling eg. aluminium cans

The main recycling activity in Tuvalu is undertaken by Cancare, operating at the backyard of a bar / nightclub in Funafuti. It crushes aluminium cans at AUS$0.90c / kg or approximately 2c / can. About 3-4 containers or about 50-70 tonnes of aluminium cans are recycled per annum. However, numerous aluminium cans are found all over the island. There is an urgent need for educating the public on the environmental and financial

benefits of recycling not only aluminium cans but also non-ferrous metals and alloys such as copper, brass, lead, stainless steel etc.

A number of individuals / businessmen have expressed interest in starting a metal recycling company for recycling large metallic scraps, vehicle bodies, batteries and radiators when and if it becomes feasible.

Similarly to other small pacific islands, one of the highest costs for recycling is the transportation of recyclable goods and this can be higher than the return on the commodity carried. In Tuvalu, the significant imbalance of imports to exports means that there are opportunities to utilise empty ships leaving Funafuti. The negotiation of appropriate shipping rates will also be critical to the viability of recycling in Funafuti.

There is potential for considerable recycling, but is likely to be marginally viable in economic terms and may need to be subsidised by the community, Government or another body wishing to dramatically reduce the waste disposed of in the landfills.

Potential markets for recycled material is in Australia, New Zealand or Asia.

Food and green wastes

Considerable amount of solid waste is food and garden wastes. Already these have been traditionally fed to the pigs and other animals. Other food and garden wastes which the animals can not digest (such as palm tree branches) have now been collected 2 times a week and have been composted using the 6 month trial waste management system's collection system.

According to Alan Boase of Golders Associate in Brisbane, they have been involved in AusAID project, which include composting of organic material such as leaf and garden waste from households. Most of food waste is traditionally fed to the pigs and often it is scavenged by the dogs.

3.4 Waste Storage

At residential premises - bags and bins. In collection areas, the Council used to provide 44-gallon receptacle for free. Currently, as part of the AusAID / Golders trial waste collection system, the serviced households are provided with 120L wheelie bins.

At institutional premises and at commercial and industrial premises - Each premise is audited and assessed in terms of types and quantities of waste material resulting from the facility. The premises are then provided / recommended types and size of the waste receptacles necessary and their collection systems are conducted accordingly.

3.5 Waste Collection

Waste collection is the responsibility of Funafuti Town Council (FTC). The collection service only covered 20% of the total population of Funafuti Island, approximately 900 people. The FTC charged a range of collection fees from private dwellings to commercial premises. The following were the collection fees charged by the FTC.

- Private house: AUS$30/yr
- Government Dept / Houses: AUS$70/yr
- Small Canteen: AUS$70/yr
- Hotel: AUS$400/yr
- Hospital: AUS$350/yr
- Restaurant: AUS$150/yr
- Builders, Contractors: AUS$200/yr

- Supermarket: AUS$100/yr
- Tuvalu Co-op Society: AUS$400/yr
- Branches, cuttings: AUS$10/load
- Rubbish bin: AUS$15/yr

The FTC collected waste 6 days per week within Funafuti from Monday to Saturday and on public holidays. There was no segregation of waste. The Council had two tractors with trailers for collection of waste. The collection crew comprised of one driver and five collectors. Protective gear was not usually worn.

The residents had been provided with 44-gallon drums as waste receptacles for free by the FTC. The FTC later charged AUS$15/bin. Only 131 out of the 300 households covered by the FTC have purchased a wheelie bin. The workers complain that the 44-gallon drums are too heavy to handle and the open drums are also affected by rain, flies and vermin.

The collection of garbage collection/disposal fees were a problem for FTC. Less than 20% of the population in Funafuti had their waste collected by the FTC. The remainder of the population was responsible for the disposal of their own waste. This has resulted in indiscriminate dumping of refuse on any vacant land around the island, including borrow pits.

Most recent development to the collection system is the trial waste collection system by the AusAID funded project. Last 6 months (late 2000 to mid 2001), the collection system consisted of 2 garden waste pick ups and one municipal solid waste per week for the residents and similarly for the commercial and industrial premises. However, only 20% of the population received this service and approximately 60% of the population received a collection system in every 3 weeks due to lack of source segregation of waste and slow service.

To the private residents, the collection system was free-of-charge and to the commercial and industrial premises, there was a service charge. Currently, the system is going through a transitional period where the authorities will charge for the collection system and the residents have choice to sign up for continuation of the collection system or not have collection system servicing their premises. Approximately 80% of the population are serviced by the collection service. The commercial and industrial premises are most appreciative of the collection system and are happy to continue paying for the collection fee according to the project manager at Golder Associates (May 2001).

3.6 Waste Disposal

Waste on Tuvalu was disposed of at dumps located in borrow pits, which are remnants of excavations conducted around Funafuti during the second world war for fill material for the airport in Vaiaku. There are ten borrow pits located on the Funafuti Island and some of them have been used as landfills. The daily maintenance of the landfill is the responsibility of FTC.

Borrow pits used as landfills were littered with aluminium cans, ferrous metals, garden waste, plastics and cardboard etc. Odour did not appear to be a problem at the borrow pits. During high tide they filled up with water causing the disposed materials to float or be partly submerged. Residents on the island have begun to build pile or stilt houses above the borrow pits. There was also little attempt to clean up the borrow pits by locals.

During 1999 survey by SKM for SPREP, the FTC was utilising one of the two designated borrow pits for waste disposal. These are Borrow Pit-10, located on the north-eastern end of the runway, within town centre and the alternative pit is Borrow Pit-3, approximately 6km from Vaiaku town centre.

According to FTC, Borrow Pit 10 was being used as Pit 3 was too far away and only one of the two FTC tractors was operational with limited carrying capacity. Residents with vehicles are instructed to dispose of their waste at Pit 3. Pits 10 and 3 are not waterlogged and no cover is being used. Waste is burnt by residents after dumping.

Golder Associates as part of the AusAID waste management trial designed a landfill nearer to the town. This one cell has a life of approximately 5 years and has been designed using natural material and material already existing on the island. The new landfill has not been approved in the EIS process yet and currently Borrow Pit-3 is being used. Once this trial landfill is successful, other burrow pits will been transformed into this type of landfill for future disposal of waste.

The owners of the landfill site have agreed for a waste disposal site on their land only if the landfill is a hardfill (waste consisting of inert waste only). Separation of solid waste had been conducted in the last 6 months and according to the Golder Associate's project manager, the system is effective.

3.7 Management of Special Wastes

Medical waste (sharps, contaminated waste etc.) from the main hospital is segregated from the normal solid waste and are incinerated in the hospital's retrofitted and recommissioned incinerator.

Household hazardous waste are separated at source and disposed at a designated building. The waste has not been exported for disposal yet but once the legal framework of exporting waste is in place, the waste will be shipped out to either New Zealand or Australia. These wastes are such as spray cans, paint / solvents, waste oil, batteries and pesticides.

4. FUNDING OF WASTE MANAGEMENT

Some of the residents felt that the current rate of AUS$30/yr may be too expensive and apparently the collection of fee was a problem for the Council. They had been considering abolishing waste collection fees for private dwellings and providing a free collection service.

The operational budget is as follows:

Table 4.1: Funafuti Town Council Operational Budget (SKM 1999)

Item	Amount (AUS$)
Garbage Bin Collection	3,350
Disposal Fees	15,000
Total	18,350

With the limited revenue and small operational budget to work with, FTC required additional funds to improve their services and maintain their vehicles and workforce. It was not recommended to abolish the fees, as this would further decrease the budget for the collection operation.

AusAID funding for the Waste Management Project has allowed the free trial waste collection system and the current transition to charging the residents of the waste collection system, as explained in the section 4.5. Therefore, the authorities are looking at the financial sustainability of the project and on-going funding for waste collection and disposal.

5. RELEVANT GOVERNMENT AGENCIES

According to Golders, there is no particular authority to manage waste management in Tuvalu. However the following authorities are involved in waste management.

Ministry of Natural Resources and Environment

Mr Mataio Tekinene: Environment Officer	Ph: (688) 20179	Fax: (688) 20826
Mr Pani K. Laupepa: Assistant Secretary	Ph: (688) 20836	Fax: (688) 20826

Ministry of Mineral Resources and Environment

Mr Enake: Environmental Officer Ph: (688) 20179 Fax: (688) 20826

Funafuti Town Council:

Is responsible for collection of waste from private households, commercial properties in the limited area of Vaiaku. Also responsible for daily maintenance of the landfills (borrow pits)

Mr Elia Tavita: President

Mr Solomona Ielenia: Vice President

Mr Pikona Satupa: Secretary

6. SOURCES OF INFORMATION

- SKM (1999) *SPREP Solid Waste Characterisation Study and Management Plan – Tuvalu*
- Personal Communication: Alan Boase of Golder Associates about the AusAID Tuvalu Waste Management Program, April 2001

Japan International Cooperation Agency

GUIDELINES FOR SOLID WASTE DISPOSAL SITE MANAGEMENT IN PACIFIC ISLAND COUNTRIES

COUNTRY REPORT ON URBAN SOLID WASTE MANAGEMENT

Honiara, Solomon Islands

1. WASTE MANAGEMENT POLICY AND PLAN

An Integrated Solid Waste Management Plan was prepares by SKM for SPREP in 1999. This was known as the Solid Waste Characterisation and Management Plan Project. However this plan is only a report for the consideration of Solomon Islands Government.

The objectives of the Integrated Solid Waste Management Plan for Honiara are:

- To create a framework that integrates all levels of solid waste management from legislation, government involvement, municipal council management, waste management operations, businesses, community bodies and the public.
- To ensure that solid waste is managed in the most appropriate manner for Honiara and the people that live there, both economically and environmentally.
- To incorporate sustainable environmental management principles and waste minimisation initiatives into the plan so as to minimise the environmental effects of solid waste management.

The Plan addresses Waste minimisation; Refuse collection; Disposal of refuse to the landfill; Special wastes; Community involvement; Organisation of solid waste management; and Implementing the Plan.

The World Health Organisation (WHO) has funded two reports on waste management in Honiara in 1991 and 1992 and both reports identified the need to upgrade both the refuse collections system and the landfill waste disposal site.

2. RELEVANT LEGISLATION, REGULATIONS, AND GUIDELINES

In the Solomon Islands, the following legislation covers solid waste management issues:

The Public Health Act (PHA) 1980 & The Public Health Regulation 1980

Provides mechanism for regulating and controlling domestic refuse, establishment of refuse point, and covers health, sanitation, cleaning, scavenging and disposal of waste.

The Honiara Litter By-Law 1993

Supposed to prevent littering in public places and the offenders are liable for fines if they do so. Currently, this is not enforced effectively.

The Environment Bill 1998 & the Environment Act 1998

Makes provision for the protection and conservation of the environment, the establishment of the environment and Conservation Division and the Environment Advisory Committee.

Section 3 (c) of the Act highlights waste minimisation and management and it also allows for licenses for discharges and penalties for non-compliance of fines up to SBD$10,000 or imprisonment of up to 12 months. Pollution abatement notices are also covered in this Act.

3. CURRENT SOLID WASTE MANAGEMENT PRACTICES

3.1 Waste Generation

A 1990 Limited Household Survey, Honiara (WHO Mission Report, 1991) gives following data.

Table 3.1: Waste Composition in Honiara 1990

Waste Type	Weight (%)
Vegetable / Putrescible Material	16.7
Paper	2.2
Metals	8.2
Glass/Ceramics	1.9
Textiles	0.1
Plastics	3.9
Bones	0.7
Miscellaneous (small pieces of mostly organic matter)	66.3

The average daily waste generation by the domestic sector was 0.38kg/person/day and its bulk density was 270kg/m^3.

In 1999, a solid waste audit and characterisation was conducted in Honiara by the project team (SKM) for SPREP Solid Waste Characterisation and Management Plan Project. The three activities were waste classification at the Honiara Landfill (for 4 days); waste audits on selected businesses; and interviews with people involved in waste management.

The following Table 3.2 gives typical average composition of the waste collected in the municipal collection system based on waste classification at the landfill for 4 days (SKM, 1999).

Table 3.2: Waste Classification in Honiara Landfill 1999

Primary Waste Classification	Average Percentage (wt%)
Paper	5.9
Plastic	16.8
Glass	4.5
Metals	6.1
Biodegradable	64.6
Textiles	1.8
Potentially Hazardous	0.1
Construction and Demolition	0.1
Other	0

A waste generation rate of 0.62kg/person/day was estimated from the audit. Considering the population of Honiara of 48,000, the total waste generated per year is 10,862 tonnes or over 51,970m^3.

3.2 Littering and Indiscriminate Dumping of Waste

The population of the Solomon Islands in general do not see solid waste as a problem and this is probably why they are not concerned about littering and illegal dumping (SKM, 1999).

Another issue is the contractor's role in collecting the waste. The contractors collection times are irregular and wastes are often left uncontrolled for longer periods of time. They claim that they are unable to adhere to the conditions of the collection schedule because the contract prices are too low, breakdown of vehicles and unsuitable collection vehicles and rubbish bins.

The 1999 SKM report analysed the total number of loads of waste taken to the landfill by the contractors in 1998. The analysis shows that the contractor is taking 1.7 loads to the landfill per day on average, which is well below their minimum contractual agreement of 3 loads per contractor per day (4 loads per contractor per day on the Contract). The SKM report recommends that the contractual arrangement should be reviewed.

3.3 Waste Minimisation Activities

There is only a very limited education in waste management in Honiara and a moderate level of awareness of waste management issues, and littering and illegal dumping of waste is still a problem.

Honiara Town Council has undertaken public awareness promotions about keeping the environment clean and free of health hazards generally through radio programs and newspaper. An annual week-long "keep Honiara Clean" Campaign has been implemented where commercial, residential areas and the general public clean up their respective environments.

The SKM report recommends that the population will require education over long periods before they will adopt waste minimisation practices. The general impression SKM saw was that the population of the Solomon Islands in general do not see solid waste as a problem and this is probably why they are not concerned about littering and illegal dumping. According to SKM, it has become a part of life and the people have learnt to live with it. This attitude requires considerable effort over long term to change.

Recycling is undertaken in Honiara as people value the recycling of products with monetary value such as bottles and cans. A returnable bottle system also functions in Honiara, especially beer and soft drink bottles. However, the national brewer, SolBrew, is facing difficulties in getting back approximately one million beer bottles as the empty bottles have been 'stockpiled' by beer consumers who believe the buy-back price will increase soon. SolBrew offer 40c/bottle and its agent offer 30c/bottle.

There seems to be no waste paper and cardboard recycling in Honiara.

Scavenging is conducted at the landfill for scrap metals and other materials. One local company (B.J.S Agencies Ltd) and one Australian company were involved in the recycling of scrap metal such as aluminium cans, copper, brass, aluminium, lead, stainless steel, hot water systems, batteries, radiators and all other non-ferrous scrap metal (found in the 1997 Solomon Islands Telephone Directory). The local company is finding recycling of non-ferrous metals very profitable and would like to expand to the other islands of the country but would like a reduced freight cost for shipping from the other islands. The company has found recycling ferrous metals such as junk car and ship bodies as uneconomical due to low price of ferrous metal.

Another waste minimisation initiative undertaken in Honiara is composting of organic waste. As part of the "Keep Honiara Clean Campaign" (now "Keep Honiara Healthy Campaign") funded by the Ministry of Health and Medical Services, WHO and UNICEF, the home vegetable gardening project was established along with projects concerning personal hygiene, environmental cleanliness, nutrition, proper yard maintenance). As the project evolved over the years, a demonstration gardening and distribution centre was established to educate participating householders (mainly housewives), on the techniques of vegetable gardening, composting and food preparation through a regular weekly gardening workshop. An estimated 20-30% of the population may be benefiting from this project and it has been operating for over 13 years (in 1999) and continues to benefit the people of Honiara.

3.4 Waste Storage

The Council specifies the type of waste receptacle that should be used such as 44-gallon drum, but these are often not used and the waste is often left in piles or bags on the side of the road. When the drums are used, they are often unmanageable for the collection staff, as they are too heavy and unwieldy. Sometimes, up to 8 households use the same drum, so it can be very full and often unclean. The uncovered drums also fill up

with water after a rain and the waste is submerged in water. Waste that is dumped by the roadside not in a bin is often scattered by dogs.

3.5 Waste Collection

The Environmental Health Division of the Honiara Town Council manages all aspects of waste collection and disposal in Honiara although individuals take a significant amount of industrial and commercial waste to the dump.

Contractors employed by the Honiara Town Council collect household rubbish up to 2-3 times per week in Honiara. For collection purposes the town is divided into 11 residential areas plus the markets. There are 12 different contractors, generally using 3 tonne open trucks and one using a 4 tonne truck. The contractors are paid approximately $300/day and are required to carry out a minimum of 3 loads to the dump. The contractors are bound by a standard agreement entitled "Refuse Collection Agreement" which was signed in 1995.

Collection generally starts at 7am and is undertaken in the morning only, however, these times are unreliable and wastes are often left uncontrolled for longer periods of time.

The Council as requested collects commercial and industrial waste.

Waste collection fees are as shown in the table below.

Table 3.3: Waste Collection Fees 1999

Waste Type	Charge per collection
Residential	Free
Hospital	Free
Industrial / Commercial	$5
Offices	$2.50

Market waste and some trade waste is collected by the Works Division of the Honiara Town Council under direction of the Environmental Health Division. The Council owns 4 small tipper trucks and one 4-5 tonne compactor for these collections. Market waste is collected every evening.

Problems identified by SKM included:

- inappropriate waste receptacles;
- collection vehicles not suited to terrain or loads required;
- waste collection staff not trained;
- collection schedule not adhered to;
- no waste segregation or minimisation of waste to dump; and
- lack of data on collection system operations.

3.6 Waste Disposal

The landfill in Honiara is located on flat reclaimed land adjacent to mangrove swamps and about 6km from town in the Ranadi industrial area. The landfill is partially fenced but there is no gate or gatehouse. There is an access road along one boundary of the landfill with tipping occurring at all points along the road. This landfill is used for domestic, commercial and industrial wastes.

The landfill is an open dump with no provision for daily cover although a limited amount of covering occurs on an ad hoc basis. Visually, it is a large expanse of uncovered waste with areas of stagnant, anaerobic water in the middle. At times tipping occurs on the road to the landfill because the entranceway is blocked with rubbish. There is no segregation of waste at the landfill and all types of waste are accepted.

There are two landfill controllers who direct the vehicles to dump their load. A bulldozer is hired from a private contractor for 1-2 days every 2-3 weeks to move and compact the waste and to clear the road to the landfill. This costs SBD$400/hour and a total of approximately $4000 per time.

There is no leachate treatment or control at the site. There is a significant fly problem as there is no spraying at the site.

Combustible rubbish is often burnt at the dump to reduce its volume although the waste seems to burn in an uncontrolled manner. There is no fee for dumping at the landfill and there are scavengers working at the landfill collecting scrap metal and other goods of value.

Problems identified with waste disposal were:

- the current dump is past its life, however there is an inability to find another suitable site for sanitary landfill;
- land tenure problems with finding a new site;
- rapid growth of urban population; and
- lack of data on waste volumes and types.

3.7 Management of Special Wastes

Information on management of Special Waste was not available.

4. FUNDING OF WASTE MANAGEMENT

Waste management activities in Honiara are funded by the Town Council, who recoup some of the costs via waste collection fees for commerce and industry. No fees are charged for waste disposal.

5. RELEVANT GOVERNMENT AGENCIES

Honiara Town Council: responsible for all aspects of waste collection and disposal.

Senior Health Inspector: Abednigo Maeohu	Ph: (677) 20227	Fax: (677) 20433
Chief Health Inspector: Moses Harisimae	Ph: (677) 20230	Fax: (677) 20433

Solomon Islands Water Authority:

Environmental Engineer: Katheryn Clarkson

Department of Natural Resources

Joe Horokuo	Ph: (677) 25849	Fax: (677) 21245

Ministry of Health and Medical Services

Ethel Napolu

6. SOURCE OF INFORMATION

SKM (1999) *SPREP Solid Waste Characterisation Study and Management Plan – Solomon Islands*

Japan International Cooperation Agency

GUIDELINES FOR SOLID WASTE DISPOSAL SITE MANAGEMENT IN PACIFIC ISLAND COUNTRIES

COUNTRY REPORT ON URBAN SOLID WASTE MANAGEMENT

Port Moresby, Papua New Guinea

1. WASTE MANAGEMENT POLICY AND PLAN

Port Moresby does not have a waste management policy.

The report by SKM (1999) is the nearest thing to a waste management plan for Port Moresby.

Previous studies relevant to waste management include:

- 1985 – Department of Environment and Conservation (DEC) carried out a 30-day domestic solid waste survey at the Burundi Dump.
- 1994 – Australian International Development Assistance Bureau funded "Country Environmental Profile of Papua New Guinea" study outlining some major problems of urbanisation and its detrimental impacts on the local environment and infrastructure.

2. RELEVANT LEGISLATION, REGULATIONS, AND GUIDELINES

The Public Health Act (PHA): Outlines provisions for regulating and controlling domestic refuse, the establishment of refuse points, and also covers health, sanitation, cleaning, scavenging and disposal of municipal solid waste into an area other than the designated dumping sites.

The Environmental Planning Act Chapter 370, 1978: provides environmental impact assessment of major development projects including an instrument to monitor and control developments such as proposed sanitary landfills (1999).

The Environmental Contaminants Act Chapter 386, 1978: provides mechanism for regulating the importation, distribution, and discharge of contaminants into the environment. It has provisions for regulating littering, the breaking of glass, and general regulation of discharges from waste dumps into the environment. It is an instrument for the prevention, abatement and control of contamination and of the protection of the environment.

The Water Resources Act Chapter 205, 1982: deals with the protection of natural water resources and its management. It provides the regulatory mechanism for controlling discharges of contaminants into natural water systems.

The Amended Organic Law on Provincial Government, 1995: provides mechanism and gives power to local governments to set up by-laws to cover municipal waste management.

New Environment Bill – content not reported.

3. CURRENT SOLID WASTE MANAGEMENT PRACTICES

3.1 Waste Generation

The 30-day survey in 1985 (as mentioned in Section 2) estimated average daily waste generated by the domestic, commercial and industrial sector varied between 0.21-0.39kg/person/day, of which over 53% were biodegradable.

According to the 1999 solid waste survey (SKM) conducted at the Sabama settlement (low income), Waigani PTC Housing Scheme (middle income) and Waigani Heights, in Port Moresby, the following represents typical waste figures.

- Bulk density of waste: 200kg/m^3
- Waste generated from households in Port Moresby: 2.8kg/house/day or 0.40kg/person/day
- Annual waste generation: 146kg/person/year or 43,800tonnes/year or 219,000m^3/year
- Volume reduction after 50% reduction in biodegradable wastes through composting: 547,495m^3/year

In the above survey the following waste composition was identified.

Table 3.1: Waste Classification in Port Moresby 1999

Primary Waste Classification	Weight %
Paper	11.8
Plastics	12.7
Glass	8.9
Metals	12.2
Biodegradable	50
Textiles	1.5
Potentially hazardous MSW	2.0
Construction and Demolition	0.9
Other	-

3.2 Littering and Indiscriminate Dumping of Waste

The Public Health Act states that an offender of littering and illegal dumping could be fined up to K1000. However, littering and illegal dumping occurs in the waterways, drains, roadsides and other public places with beer can/bottles, soft drink bottles, used plastic containers, wrappings, packaging and beetle nut peelings.

SKM (1999) found that the DEC and National Capital District Council (NCDC) lack the resources to enforce legislation such as the Public Health Act and the new Environmental Bill.

3.3 Waste Minimisation Activities

The 1999 SKM study mentions that the DEC is planning to launch an education and awareness campaign where key stakeholders of solid waste management (eg. WHO, Ministry of Health, MCPNG, NGOs) will work together with the members of the community.

The study also reported that MCPNG are already in the process of establishing a committee of representatives from manufacturers, users, domestic reps, regulators (DEC) and packers. This committee will look into educational programs to promote the three R's of waste minimisation: Reduce, Reuse and Recycle.

In PNG, there are about eight companies involved in recycling of scrap metals such as aluminium cans, copper, brass, other aluminium, lead, stainless steel, hot water systems, batteries, radiators and all other non-ferrous scrap metals. The locals are aware of the value of the metals, as there are many scavengers at the landfills.

The NCDC initiated a campaign in 1999, for the collection of plastics at a rate of 20t (cents) per bag. This campaign appears to have been successful, however, the common disposal practice of dumping in trenches

is not very environmentally acceptable. An investigation of possibly sending collected plastic bottles to Australia or New Zealand for recycling is recommended. Coca Cola Amatil Ltd (PNG) indicated a PET bottle recycling company is to commence operation in PNG in December 1999. The Coca-Cola's representative also expressed intentions to provide monetary incentives for the return of PET bottles as practiced in Fiji.

There is no known waste paper or cardboard recycling program in Port Moresby.

3.4 Waste Storage

Domestic: 240L MGB (Mobile Garbage Bin) or bin (smaller) or drums

Institutional and commercial: Information not available / not reported

3.5 Waste Collection

The NCDC and their contractors are responsible for waste collection in Port Moresby and caters for domestic, commercial and industrial, sanitary wastes, school wastes and public wastes (from public amenities). NCDC has an annual budget of $4 million Kina (NZ$2.5million) for waste management. The waste collection fees are summarised below.

Figure 3.2: NCDC Waste Management Rates 1999

Frequency of Collection	Fees (K)
SANITARY FEES PER MONTH	
Daily collection (per bin)	10
Twice weekly collection (per bin)	23
Special collection (per lift)	5
DOMESTIC FEES PER MONTH	
Twice weekly collection (bin)	10
Twice weekly collection (240L MGB)	33
Daily collection (per bin)	35
Daily collection (240L MGB)	115
Special collection (per bin collection)	8
Special collection (drum per collection)	30
COMMERCIAL AND INDUSTRIAL GARBAGE FEES PER MONTH	
Once weekly	20
Twice weekly	33
Three times weekly	40
Four times weekly	60
Five times weekly	85
Six times weekly	100
Daily service	115
Twice daily service	130
Three times daily service	145
N.B. A K10.00 additional charge shall be levied for any additional bin service.	

Frequency of Collection	Fees (K)
FEES FOR USE OF WASTE DISPOSAL DEPOTS	
Small cars	5
Utilities to 4WD	5
1.5 tipper truck and above	7
K600 tipper truck and above	10
Industrial waste bins	8

Many locals do not pay their waste collection fee and are responsible for their own waste disposal, eg. settlement in Sabama (part of low income group).

The Council contracts out all waste collection services. Domestic waste collections from the three major electorates in Port Moresby are conducted by three contractors and another contractor collects commercial and industrial waste. Approximately 270 commercial and industrial entities have their wastes collected by NCDC (from Badili, Boroko, Gordons, Ela Beach, Hohola, Koki, Konedobu, Sabama, Tabari, Tokarara, Town area, Waigani, Gerehu, 7 Mile, 6 Mile, 4 Mile and 2 Mile) while some commercial and industrial organisations transport their own waste to the landfill. The commercial and domestic collections are governed by a commercial service agreement.

Domestic waste is collected once or twice a week from Monday to Saturday and on special request. Commercial and industrial waste collection varies from once to seven days a week. There is no segregation of green or other waste.

A driver and 4 collectors are assigned to each tipper truck. There are 12 trucks collecting the domestic waste and 7 trucks collecting commercial and industrial wastes. Of these, 8 trucks are compactor vehicles with $4.5m^3$ – $15.3m^3$ capacity. The other 11 are open trucks ranging in size from $0.35m^3$ to $1.5m^3$.

As part of the community outreach project, NCDC have contracted a tipper truck from village refuse. The council provided the village with one 44-gallon drum for every three houses.

3.6 Waste Disposal

Port Moresby has two major landfill sites:

- Barundi Dump, located in the west (currently being rehabilitated); and
- 6 Mile Dump, east of Port Moresby (currently used for disposal of domestic, commercial, institutional and industrial waste).

The two sites are legally gazetted and if the contractors are found dumping waste at other sites, their contracts are terminated immediately.

The landfills are the responsibility of NCDC and their contractors. The landfill controlled dumping and burning is carried out with the assistance of a bulldozer and backhoe which are hired by the NCDC at a combined cost of K400 /hr.

SKM (1999) reported that the landfill operations generally have inadequate compaction with minimal soil cover. The landfills do not have protective lining for leachate collection or fences to prevent scavengers from entering the site.

Restricting access to the landfills is very important for operation and public health reasons. However, residents of a nearby squatter settlement are starting to build houses on piles or stilts adjacent to the landfill and scavengers have constructed temporary makeshift shelters at the landfill where they wait for the trucks. Scrap metals, plastic goods, wrappings, construction materials, textiles and other reusable material are salvaged for cash.

The 6 Mile Dump has an Environmental Code of Practice which at times operators do not adhere to. The dump drivers and operators of machines working on the collection truck and dump area do not wear protective gear. The waste collectors and operators are not properly trained and therefore are not aware of relevant waste management issues. The 6-Mile Dump caters for a huge population. It is therefore vital that the landfill is well managed in economic and environmental terms. For future planning, waste disposal record should be kept.

There is no rehabilitation plan for any of the landfills.

Siting a new sanitary landfill is difficult due to land tenure issues. Most areas outside the suburbs and cities are customary land and the landowners demand very high fee for leasing their land.

3.7 Management of Special Wastes

Information on management of Special Wastes was not reported.

4. FUNDING OF WASTE MANAGEMENT

Funding for the provision of waste management infrastructure and services is raised via fees for waste collection services and fees for use of the waste depots. It was not reported whether the fees generate sufficient funds to cover the costs of providing the infrastructure and services.

5. RELEVANT GOVERNMENT AGENCIES

National Capital District Commission (NCDC) – Department of Community Services: responsible for waste collection and disposal of Port Moresby.

Senior Environmental Health Officer (Waste Management): Paul Wiwi Ph: (675) 325 3699
Fax: (675) 325 9689

Department of Environment & Conservation (DEC): Funding and waste management issues stakeholder.

Manager, Water Resources Management Branch: Lois Kesu Nakmai

Project Coordinator (International Treaties and Conventions), Cooperate Services Division: Godfried Angi

6. SOURCE OF INFORMATION

SKM (1999) *SPREP Solid Waste Characterisation Study and Management Plan –PNG*

Japan International Cooperation Agency

GUIDELINES FOR SOLID WASTE DISPOSAL SITE MANAGEMENT IN PACIFIC ISLAND COUNTRIES

COUNTRY REPORT ON URBAN SOLID WASTE MANAGEMENT

Alofi, Niue

1. WASTE MANAGEMENT POLICY AND PLAN

A Waste Management Plan was completed by Waste Management Adviser, Greg Wolff, of Pacific Technical Assistance Facility, AusAID in October 2000. This report was endorsed by the Cabinet of Niue on 21 December 2000. AusAID funded the project and the aim of the Waste Management Plan is to make Niue the cleanest and healthiest nation in the Pacific through the following objectives:

- to minimise waste requiring disposal;
- to change the communities attitude through education;
- to provide an effective waste disposal system;
- to protect and improve public health;
- to protect the environment of Niue;
- to assist economic development;
- to develop practical and enforceable regulations for waste management; and
- to assist agricultural development.

2. RELEVANT LEGISLATION, REGULATIONS, AND GUIDELINES

A range of legislation or draft legislation exist, which contain provisions relating to waste management. The Environment Bill, which is presently in draft form, contains legislation that specifically targets waste management issues. The extent of available legislation or draft legislation relating to waste management needs to be examined to determine if it is adequate for present and future needs.

It is recommended in the Niue Waste Management Plan (2000) that existing and draft legislation relating to waste management be compiled and further developed if necessary to provide waste management legislation relevant to the present and future needs of Niue.

3. CURRENT SOLID WASTE MANAGEMENT PRACTICES

3.1 Waste Generation

A survey was undertaken between 29th June 2000 and the 10th July 2000 as part of the regular household waste collection service (Wolff, 2000). Every fifth household collection service was placed in a separated portion of the waste collection vehicle. The number of collections was recorded. The following table shows the composition of waste stream.

Table 3.1: Percentage weight of waste stream components

Waste Classification	Average Weight %
Disposable Nappies	6.5%
Metal cans	8.1%
Paper/Packaging	14.7%
Plastic	6.9%
Glass	1.6%
Food Scraps	9.6%
Greenwaste	44.7%
Other	8.0%

The following data is from the survey.

- Average waste density (density = mass/volume) 168.7 kg/m3
- Daily household waste generated 1.30 kg (0.36 kg / person/ day)
- Annual waste generation 478.40 kg/household/year
- Household waste requiring disposal in one year 247203.6 kg or 247.2 tonnes/year
- Household waste volume 1465.34 m3
- Estimated yearly volume collected by waste contractor 2500.00m3

3.2 Littering and Indiscriminate Dumping of Waste?

Litter on Niue can be found along most roads, in the bush and at scenic spots. Often soiled nappies are found in crevices in the rocks or simply thrown on the ground. Litter can wash into the ocean, create vermin harborage and breeding grounds for mosquitoes.

There are very few litterbins distributed throughout Niue however it has been noted that where litterbins are supplied, there is little or no attempt to place litter in the bins.

There are many abandoned / dumped vehicles present on Niue. The import of vehicles to Niue has increased over the past fifteen years to the stage where the majority of households on the island own at least one vehicle. In excess of 800 vehicles were registered on Niue September 2000 (Wolff, 2001).

Most vehicles are second hand and sourced from Japan or purchased in New Zealand. It is estimated that approximately 300 vehicle wrecks are stored in villages or at bush paddocks.

A number of vehicles have been utilised for land reclamation at Gabes Restaurant in Alofi. The site is located on the ocean cliff and has the potential to be effected by hurricane wave action.

The use of vehicle wrecks for land reclamation may be appropriate in certain locations however site selection should comply with engineering, environmental and land use criteria. An appropriate approval system needs to be developed as recommended by the Niue Waste Management Plan (Wolff, 2000).

3.3 Waste Minimisation Activities

Recycling is a major consideration for reducing waste volumes requiring disposal. Aluminium can recycling is undertaken successfully on Niue.

Plastic and metal containers are relatively small of the Niue waste stream and recycling of these components should be considered. The volume of plastic and metal is significant components and the economics of recycling may be a limiting factor. Costs associated with undertaking a recycling scheme include the provision of a small recycling plant consisting of a sorting conveyor and compacting/bailing equipment. Shipping costs, unless subsidised, present the greatest impediment to provide a recycling program that does not require significant financial subsidisation. The market for sale of recyclables is volatile and expected returns can significantly fluctuate.

It is considered that there is potential for a recycling program for plastics, tin cans and glass to be established.

Niue with a small population and no major industries is fortunate not to have major waste problems however complacency and lack of awareness of waste management issues could produce impacts which endanger public health and the environment of Niue.

There is indiscriminate disposal of wastes to caves and the bush, excessive littering, batteries and waste oil disposed inappropriately and overuse of agricultural chemicals and fertilisers. These activities may not be undertaken in a deliberate sense, rather it may be lack of awareness of the potential impacts these practices cause that is the problem.

An integrated education and awareness program should be established linking the significance of responsible waste management to protection of public health and the environment of Niue and promoting the aim of the WMP that, Niue is recognised as the cleanest and healthiest Nation in the Pacific.

3.4 Waste Storage

At residential premises waste is stored: in wheelie bins, metal bins as well as other bins constructed from 200L metal or plastic drums and woven baskets. There is not a regular supply of appropriate waste containers available on the island for purchase. The majority of households do not have waste bins and present their waste for collection in plastic bags.

3.5 Waste Collection

The waste collection service is undertaken by contractor and administered by the Department of Health. No charges are levied on the community for the service. The collection service is provided to every domestic household on the island.

The collection vehicle is a high-sided open tray vehicle with a collection capacity of approximately 6.4m^3. Waste is placed on the road side for collection however many houses in villages do not front the main road and the contractor drives along access roads to undertake these collections.

All villages except Alofi are provided with a weekly collection service. Alofi is provided with a collection service three times each week. The waste contractor provides a good service. No limitations are placed on the amount or type of waste collected and whilst the waste presented by each household is generally small some households will present bulky appliances and large amounts of greenwaste.

The majority of collected waste is dumped at the Makato rubbish dump, however, some loads from the North and South collection are dumped at village dumps.

The contractor is keen to improve and integrate the service and has discussed proposals in relation to greenwaste, composting and transfer station proposals.

Whilst the waste collection service is considered adequate a range of issues impact on the effectiveness and efficiency of the service and include:

- Lack of policy, legislation or guidelines in relation to the collection service
- Cost (no cost) of service and no consideration for user/polluter pays principles
- Reducing service days to Alofi from three to two
- Occupational safety aspects associated with the collection vehicle and collection method
- Potential for litter from collection vehicle
- Provision of appropriate waste containers
- Potential for incorporation of other waste management undertakings performed by the contractor.
- Reducing or eliminating dumping at village dumps
- Contract conditions and term of contract
- Community awareness and education

Waste from commercial premises consists mainly of packaging. Organic waste is generally collected for feeding to pigs. The larger commercial premises dispose of their waste to the rubbish tip by their own means. Awareness of the correct and responsible use of the rubbish tip to prevent rubbish being dumped in areas other than over the tip face is required.

3.6 Waste Disposal

The AusAID report indicated seven waste tips exist on the Island. The main tip is located in South Alofi at Makato. Other smaller tips are located in the villages of Vaiea, Hakupu, Liku, Lakepa, Taupa and Mutalau.

The waste tips are essentially landfill operations where rubbish is deposited and some pushing and covering occurs with rubbish being burnt on occasions. No formal operational and maintenance plan exists for any tip site. Lack of maintenance has caused the rubbish tips to be untidy and unsightly.

The Department of Health has the responsibility for operation and maintenance of the waste tips.

A multi-purpose machine (backhoe) was purchased in December 1997 as part of the AusAID sponsored Niue Water and Waste Management Project. The machine has not to date been utilised on the waste tips (1997). Informal arrangement with the Works Department provides for maintenance of the rubbish tips. These arrangements are unsatisfactory due to the lack of maintenance schedules and operational plans. Co-operation and liaison between the department personnel is also a major impediment and this needs to be improved before satisfactory outcomes will be achieved.

The AusAID report indicated that it is expected that leachate would not be significantly high in pollutants. The report does, however, recommended a monitoring program should be established to monitor change in the water quality of bores in close proximity to this site. Monitoring is also required for changes in or impacts to the marine environment on the coast below the waste disposal site. The production of methane gas in the landfills on Niue would also be expected to be insignificant due to the low volume of organic matter being deposited.

Preventing hazardous waste such as batteries, oils and unwanted chemicals from being disposed at waste disposal sites will play an important role in preventing adverse environmental impacts.

Waste from the household collection service is deposited at the Makato waste tip and also at the Vaiea, Hakupu and Liku rubbish tips. Table 3.2 indicates tip location, population and households served and number of loads deposited at village tips by the waste contractor.

Table 3.2: Tip locations and population served – loads dumped by contractor

Rubbish Tip	Villages served	Population	Households	Loads dumped/week
Makato (South Alofi)	North/South Alofi	655	186	5-6 (30-36m^3)
	Makefu	92	24	
Vaiea	Vaiea	65	10	1 (6m^3)
	Tamakautoga	142	37	
	Avatele	138	42	
Mutalau	Mutalau	121	34	
	Toi	31	10	
	Hikutavake	68	22	
	Namukulu	20	9	
Hakupu		234	52	1 (6m^3)
Liku		89	23	1 (6m^3)
Lakepa		120	28	
Tuapa		136	40	
		1911	***517***	***9 (72m^3)***

The Makato waste disposal facility receives the majority of commercial waste. The site is approximately 1.33 hectares in area and has been utilised as a rubbish tip for approximately 20 years. This facility and the village waste disposal facilities also receive incidental household rubbish as well as some larger items such as appliances and building materials. Indiscriminate dumping of hazardous waste also occurs and this is likely to continue until programs are put in place to provide an alternative for disposal of hazardous waste.

All rubbish tips are located on private land. Formal or informal agreements between the landowner and the Department of Health have been made. Yearly payment may be made for the use of the land. Processes have been undertaken to formalise the agreement in relation to the Makato waste tip and investigation of the status of the other tips should be undertaken and agreements formalised where necessary.

The location of the proposed waste tip sites needs further investigation particularly in regard to future potential of the existing Makato site to act as a controlled tipping site in the medium term.

When considering locations for new waste tips, environmental and land use principles as detailed in the Sustainable Development Guidelines (Planning for Solid Waste Management) produced by the Environmental Planning Unit, Department of Justice, Lands and Survey must be regarded.

3.7 Management of Special Wastes

Quarantine Waste

The Department of Agriculture Forestry and Fisheries administer quarantine activities.

Waste from the airlines is collected and taken to the works depot where it is incinerated in the quarantine incinerator. Bins are provided on the wharf for waste from yachts, which is collected on a regular basis and incinerated. The disposal of sewage and ballast from ships is prohibited and solid waste is retained on board.

Replacement of the quarantine incinerator has been proposed. The present incinerator is a locally built unit with combustion provided by gas flame. The temperature reached in the incinerator seems inadequate to fully dispose of introduced waste.

Septic Sludge

Septic sludge is disposed directly to the ground in a designated area. This process allows liquid to percolate to the ground and evaporation to occur leaving dried sludge that undergoes degradation to humus. There is however potential for the heavily laden organic liquid to percolate to the water lens and the provision of drying beds with an effluent collection and treatment system is a simple method to prevent pollution from this source.

The sludge in its present form may contain pathogens and cannot be safely utilised as a soil additive or fertiliser. Composting the septic sludge with greenwaste may provide a safe and beneficial product to improve the viability of soils and should be trialed. Vermiculture or the use of worms to reduce waste and convert organic matter to fertiliser may also provide a beneficial process for septic sludge.

Waste Oil and Oil Filters

Potential environmental and public health impacts from waste oil, spent batteries, agricultural chemicals, hospital waste and building products containing asbestos can be minimised by establishing programs and procedures for safe disposal.

No facility is available for the disposal of waste oil on Niue. Shell Fiji Limited had previously made an offer (1998) to remove all waste oil from the Island. The offer was not taken up and recent inquiries indicate that safety and cost considerations have resulted in the previous offer being withdrawn.

Other disposal methods such as burning or biological treatment may provide an appropriate local disposal method however removal for recycling is the preferred option.

The quantity of waste oil produced on Niue is relatively small however potential exists for this substance to contaminate the water lens and impact on the marine environment.

Niue Power Corporation produces waste oil in significant and regular quantities and a secure waste oil storage facility at the Power Corporation site would provide an initial response for the collection and storage of waste oil from this facility. The Corporation is presently investigating an oil-filtering unit that would significantly reduce the period between oil changes.

The use of oil for line marking on sports fields is a de-facto method of disposing waste oil to the environment. Potential pollution from this practice may be believed to be insignificant however the cumulative effect should be considered and alternative methods of line marking encouraged.

Oil filters contain small amounts of oil residue that will leach to the environment if inappropriately disposed of. The majority of oil filters are dumped.

Vehicle Batteries

A conservative estimate of the number of spent lead-acid batteries produced each year on Niue is approximately 300. Given the number of vehicles which have been imported into Niue over the past fifteen years, a significant number of spent vehicle batteries are stored or have been inappropriately disposed.

The indiscriminate disposal of batteries has the potential to produce adverse environmental impacts.

Some batteries are broken up and the lead components melted for the making of fishing sinkers. Vapours produced during this process are hazardous to human health.

The export of spent vehicle batteries to New Zealand for recycling could achieve a cost neutral status or better if subsidised freight costs could be established.

Agricultural Chemical Waste

The increased use of agricultural chemicals for weed and pest control is rapidly replacing more traditional methods of control.

Paraquat is used extensively for weed control. Paraquat is a quick acting herbicide that destroys green plant tissue by contact action and some translocation. The chemical is extremely toxic and an oral dose of 2-3 grams (1/3 teaspoon) in humans may be fatal if untreated. The spray mist is highly toxic if inhaled and the material presents a hazard from a single acute exposure or from repeated exposures over long periods.

Chemical containers are generally disposed in the garbage.

A quantity of obsolete chemicals is stored on the Island. Some of these chemicals have been repackaged, and are stored in a shed at the Works Depot. A quantity of fertiliser and agricultural chemicals are also stored at the Department of Agriculture research farm. A cylinder of methyl bromide is stored at the piggery.

Medical Waste

A large quantity of date-expired medicines and equipment is stored in an open basement area at the rear of the hospital. The quantity and type of these materials is not available / not provided. The area is very untidy with materially generally strewn throughout the area.

It is considered most of the material could be incinerated if appropriate safety measures were taken (Wolff, 2000). Materials unable to be incinerated could be securely packaged and stored and disposed as part of the SPREP program.

Recent expired chemicals are now stored in an orderly manner in the pharmaceutical store. These materials could be progressively destroyed by incineration where appropriate.

4. FUNDING OF WASTE MANAGEMENT

The Government of Niue provides budgetary funds each year for waste management. The amount of funding is inadequate when considering the financial requirements to undertake the strategies contained in the WMP. The strategies include requirements for capital expenditure however no budget allocation has been made for these items. If provision of funds for the provision of capital items is not obtained a number of strategies will not be able to proceed.

Existing budget allocations are generally inadequate to effectively undertake some waste management programs. This situation can effect the sustainability of established programs and fail to consider emerging needs.

5. RELEVANT GOVERNMENT AGENCIES

- **Department of Health:** responsible for waste collection and disposal

  Public Health Division: Chief Public Health Officer, Holo Tafeta

  Environmental Health officer, John Hetutu

  Environmental Health officer, Peter Vakaafi

6. SOURCE OF INFORMATION

Wolff, G. (2000) "Waste Management Plan – Niue" October 2000 (Endorsed by the Cabinet as the Waste Management Plan for Niue on 21 December 2000)

7. CONTACTS FOR FURTHER INFORMATION:

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Japan International Cooperation Agency

GUIDELINES FOR SOLID WASTE DISPOSAL SITE MANAGEMENT IN PACIFIC ISLAND COUNTRIES

COUNTRY REPORT ON URBAN SOLID WASTE MANAGEMENT

Port Vila, Vanuatu

1. WASTE MANAGEMENT POLICY AND PLAN

The new Environmental Legislation (recently drafted) will allow the National Waste Management Committee to initiate the formulation of a comprehensive integrated National Waste Management Policy and Implementation Plan.

2. RELEVANT LEGISLATION, REGULATIONS, AND GUIDELINES

At a national level the following legislation applies:

- Public Health Act – controls on disposal of waste in public places and littering;
- Draft Environment Act;
- Water Resources Act provisions for pollution control and protection of water catchments;
- new Environmental Legislation – drafted recently. It will form a National Waste Management Committee for decisions of solid waste management; and
- Draft Waste Management Act – prepared in 1993 in conjunction with the World Conservation Union Environmental Law Centre. This act has not been progressed and is unlikely to until the Environmental Act is passed.

Local by-laws that deal with solid waste management issues in Port Vila are:

- Prohibition of Disposal of Litter and Rubbish, By-law No. 3, 1992;
- Cleaning of Premises, By-law No. 5, 1992;
- Public Cleansing and Prevention of Nuisances, By-law No.1, 1994; and
- Litter By-law 1997

These local by-laws deal with the prevention of littering and dumping of wastes in public areas or unoccupied land, and provision for keeping properties clean to minimise disease vectors. They all allow for a maximum penalty of 20,000 Vatu fine and / or 6-12 month imprisonment. At present there is negligible enforcement of these by-laws.

3. CURRENT SOLID WASTE MANAGEMENT PRACTICES

3.1 Waste Generation

In 1990, a limited waste survey was undertaken in Port Vila and the resulting waste composition are shown in Table 3.1 below (SKM, 1999).

Table 3.1: Composition of Solid Waste in Port Vila 1990 (Source: Truebridge, Calendar, Beech "Waste Management of Port Vila – Relocation of the Waste Tip"

Waste Type	Percentage (%v/v)
Putrescible and garden waste	65
Paper and kraft	15
Bulky wastes, cars, tree stumps, electrical appliances	3
Building debris and excavated material	5
Hospital wastes	1
Plastics	5
Other	6

In 1998, the Asian Development Bank (ADB) produced a "Sanitation Masterplan for Port Vila", which contained following table.

Table 3.2: Solid Waste Generation Factors

Waste Component	Factor (kg/person/year)	Equivalent daily generation (kg/person/day)
Total waste	219	0.6
Household waste	183	0.5
Green waste	329	0.9
Household + Green waste	512	1.4
Hospital Waste	475	1.3

In the 1999 a number of activities were undertaken by SKM including a survey of vehicles using the Port Vila Landfill; waste classification at Port Vila Landfill; and waste audits on selected were conducted. Table 3.3 shows the visual analysis from the activities conducted.

Table 3.3: Visual Analysis of Waste Classification

Waste Type	All Waste (domestic, commercial & industrial) (Average %v/v)	Domestic Only	Commercial / Industrial Only (Average %v/v)
Mixed domestic	17.9	35.9	9.9
Paper	21.5	.9.2	26.7
Plastic	6.0	5.6	5.7
Glass	1.5	1.0	1.8
Metals	5.8	4.0	6.6
Organics	38.5	42.8	36.5
Textiles	0.1	0.1	0.1
Hazardous	2.7	0.2	7.3
Construction	2.8	2.8	3.0
Other	1.7	0.0	3.0
Total	100	100	100

Results of the waste classification at the landfill are tabled below.

Table 3.4: Waste Classification Results

Primary Waste Classification	Secondary Waste Classification	Average Percentage (wt%)
Paper	Cardboard boxes	4.1
	Other Magazines, newspaper, office, tetrapak, packaging	5.6
	Sanitary	1.7
Plastic	PET	0.3
	Rigid HDPE	0.4
	Flexible HDPE & other plastics	7.0
Glass	All glass	3.3
Metals	Aluminium cans	0.7
	Other metals	2.9
Biodegradable	All organic	71.0
Textiles	All textiles including clothing, carpets and curtains	1.6
Potentially hazardous	All	0.7
Construction & demolition	All	0.7
Other	Including rubber and other	0.0
Total		100

Based on full week's records of vehicles and waste quantities, a solid waste generation rate of 0.65kg/person/day was calculated from the SKM (1999) study. Average density of waste was estimated as 162kg/m^3.

3.2 Littering and Indiscriminate Dumping of Waste

Littering and illegal dumping of wastes is a problem in Port Vila indicating a lack of awareness of appropriate waste management practices. Littering along all major highways is common. The council is under-resourced to carry out sufficient enforcement of littering.

Clean-ups of the streets and beaches are often carried out by community groups such as the Kiwanis, Rotary, the Brewery and schools.

3.3 Waste Minimisation Activities

There is very little waste management education undertaken in Vanuatu. A play about littering and adverse effects of waste on the environment was performed but it is difficult to know whether this had any effects on the actions of the public.

There is no primary, secondary and tertiary education curriculum on waste management. These should be considered for the future.

A beer bottle recycling scheme is very successful (approximately 92-94% of bottles are returned) at the Vanuatu Brewery. This may be due to the high refund of 10 vatu for each bottle returned.

A backyard operation by private individual (Vanuatu Recyclers) conducts scrap metal recycling for non-ferrous metals (copper, aluminium, brass, zinc, lead, and stainless steel). Metal are collected either by school children, from hotels or from the landfill and are crushed or stripped and packed into a container for shipping to Tool and Ingots in Brisbane, Australia. This amounts to about 2 containers (32 tonnes) per year. The owner expressed that many hotels and clubs do not participate in the segregation and collection of cans. There is no ferrous metal recycling operating in Vanuatu.

Waste oil recycling is available (only in a partnership arrangement with Unelco's waste oil) through Mobil shipping it to Fiji for burning in furnaces.

Rainbow Gardens has been operating the Municipal owned mulcher / grinder on a trial basis to make compost for gardens. However, the machine does not perform well with wet banana stems or amounts of green leaves. There have been discussions of more permanent arrangement for producing compost (December 1999).

There is no PET, paper or cardboard recycling program in Port Vila.

3.4 Waste Storage

- At residential premises - drums, metal or plastic bins, plastic bags or basket and some 240L wheelie bins
- At institutional premises - 240L wheelie bins, large skips
- At commercial and industrial premises - 240L wheelie bins, large skips

3.5 Waste Collection

The Port Vila Municipal Council collects domestic, commercial and industrial wastes in Port Vila with fees as follows.

Table 3.5: Garbage Collection Fees introduced in July 1998

Type of Garbage	Fees (Vatu per annum)
Household	6,000
Commercial waste	9,000
Restaurant	60,000
Big shop	120,000
Hotel	180,000
Hotel outside Municipal boundary	360,000
Hire of small skip	2,500 per load
Hire of large skip	3,500 per load
Long term hire	15,000 per month
Hire of small skip (outside Municipal boundary)	5,000 per load
Hire of large skip (outside Municipal boundary)	7,500 per load
Rubbish Dump Fees	**Fees (Vatu per trip)**
Small vehicle	100
Hilux	200
Lorries	300

Dislutcher	1,500

Household rubbish is collected three times a week (Monday, Wednesday and Friday or Tuesday, Thursday and Saturday). Commercial, restaurants and hotel waste is collected three – four times per week (Tuesday, Thursday, Saturday and Sunday. Generally domestic waste is placed on the kerbside.

There are 5 waste collection trucks of three different sizes. These are one $11m^3$ truck; two $10m^3$ trucks; and two $7m^3$ trucks. None of the trucks have hydraulic lifting gear. There are also ten $7m^3$ skips and six $10m^3$ skips for hire. There are ten small skips ($4m^3$) and six large skips ($7.5m^3$) and one roller truck for handling the bins.

The Council also provides large skips for waste collection to the market and high-density residential housing areas, and to some commercial premises for a fee.

Waste management staff at the Municipality consists of 6 street sweepers, 6 collection truck drivers and 12 collection workers as well as a sanitation foreman. There are also 6 workers for "greenspaces" in Port Vila and at the landfill one front-end loader driver and 1 gatekeeper.

3.6 Waste Disposal

The Bouffa Sanitary Landfill in Port Vila commenced operation in 1995 and is used for disposal of domestic, commercial and industrial wastes collected by the Municipal Council as well as wastes dumped by the general public. It is located in a valley, approximately 15 hectares in size and about 8.5 km from town. The site was selected and designed using input from experts funding by the World Bank, WHO, UNDP and ESCAP. The landfill was designed with a capacity of $525,000m^3$ and a life of 15-20 years. The filling method is trench operation – the first trench was being used in 1999 but the second trench should have been started at least in 1997. A leachate control system was designed but never installed. There is a series of three ponds for leachate and stormwater treatment but they have been used in the past as hazardous waste disposal. There were three monitoring bores installed but they have been lost.

The landfill is relatively well organised and has a separate pit area for burning of quarantine waste. The ashes from quarantine waste are dumped at the landfill face once per week. There is no segregation of waste at the landfill and all types of waste are accepted. There is a front-end loader in operation at the landfill, and newly dumped waste is shifted and compacted. There is usually weekly covering of soil, but there is uncontrolled burning of waste at the face of the landfill at times and this is dangerous – fires should be distinguished properly. Flies and odour were not significant problems. There is a gate at the main access road with a gatekeeper collecting fees. The gate is locked outside landfill operation hours.

There are no scavengers working at the landfill due to the lack of access and distance from town.

There are three closed dumping areas in Port Vila, which were used previously.

3.7 Management of Special Wastes

The septic tanker operators discharge septic tank sludge from homes and commercial properties in Port Vila at the landfill. It is also likely that some waste oil is disposed of at the landfill and sludge wastes from Asian Paints manufacturer.

The Hospital waste system is operating reasonably well with waste segregation and burning and medical waste in an incinerator.

4. FUNDING OF WASTE MANAGEMENT

The operations and maintenance costs of waste collection and the landfill are funded from the collection of property taxes as well as waste collection and tipping fees. The system is aimed at being fully self-funded and is based on a user-pays principle.

The budget for Port Vila waste management was not easily accessible and it may be because the accounting system does not readily have waste management budgets and incomes available. According to the Council staff, solid waste management services in Port Vila have not been subsidised by the Government since 1992.

5. RELEVANT GOVERNMENT AGENCIES

Department of Lands, Survey and Natural Resources – Environment Unit:

Head: Ernest Bani — Ph: (678) 25302, Fax: (678) 23565

Russel Nari

Trinson Tari

Port Vila Municipality: responsible for waste management in Port Vila

Assistant Environmental Health Officer: Albert Williams — Ph: (678) 22113, Fax: (678) 25002

Department of Health:

6. SOURCES OF INFORMATION

SKM (1999) *SPREP Solid Waste Characterisation Study and Management Plan –Vanuatu*

Dever S. & Morrison J. (1997) AusAID Pacific Regional Waste Management Study – Vanuatu Country Report

Japan International Cooperation Agency

GUIDELINES FOR SOLID WASTE DISPOSAL SITE MANAGEMENT IN PACIFIC ISLAND COUNTRIES

COUNTRY REPORT ON URBAN SOLID WASTE MANAGEMENT

Majuro Atoll, Republic of Marshall Islands

1. WASTE MANAGEMENT POLICY AND PLAN

The Government of the Republic of Marshall Islands (RMI) has no formal waste management policy, however, the United States Environment Protection Agency (EPA) recently completed an Integrated Waste Management Plan for Majuro Atoll (September 1996). The Plan contained some suggestions for a waste management policy in regard to principles and objectives.

Recommendations of the plan include:

- improvements to the existing waste collection service in Majuro;
- continual investigation and review of re-use and recycling opportunities eg metals, glass, plastic, lead acid batteries;
- an incinerator to process all combustible solid waste;
- a new landfill for the resulting ash;
- a new separate landfill for non-combustible solid waste;
- improved management of hazardous wastes - improved storage and shipping off island for disposal;
- collection and incineration of waste oil;
- investigation and repair of hospital incinerator;
- institutional changes to solid waste management - resulting in a single authority providing the services;
- development of a mechanism for long term funding of waste management activities;

However, there are no specific plans for any of the other 29 atolls, including Kwajelein, which has a substantial population (approximately 15000). The National Environmental Management Strategy prepared for SPREP (1993) describes in general strategies for improving waste management in the RMI. The recommended programmes included improvements for hazardous waste disposal, improvements to the solid waste collection and disposal system (including incineration), establishing an anti-littering public education campaign, establishing a gabion assembly unit for supply to landfills, and establishing a mandatory deposit on aluminium cans.

2. RELEVANT LEGISLATION, REGULATIONS, AND GUIDELINES

The 1996 Conceptual Integrated Waste Management Plan indicated that the RMI EPA adopted solid waste management regulations in 1989. The regulations prescribe basic standards for solid waste and litter collection and disposal and establish a permitting program for disposal facilities. The implementation and enforcement of the regulations has not been rigorous.

3. CURRENT SOLID WASTE MANAGEMENT PRACTICES

3.1 Waste Generation

The most recently available (measured in 1991) waste generation rate is approximately 0.84 to 1.34lb/person/day or 0.4 to 0.6kg/person.day (Dever & Morrison, 1997).

It is estimated that approximately 40% by weight of the waste landfilled is recoverable organic waste. Detailed waste composition is as below.

Table 3.1: Waste Composition Studies in 1991 (Mechem II & Lovelace, 1996)

Type of Solid Waste	Composition (% weight)
Metals	10.0
Paper	13.2
Plastics	15.5
Glass	5.9
Foods	2.2
Textiles	2.5
Plants	43.7
Misc.	5.5

Commercial and industrial waste is generated, however, the information on the quantity is not available / not provided and not recorded.

3.2 Littering and Indiscriminate Dumping of Waste

Indiscriminate dumping of waste is common around Majuro, although it is noted that litter could be or arise from waste awaiting collection particularly given the problems with the waste collection service). In areas that do not have waste collection service, accumulating solid waste is apparent. This particularly includes cars and other non-biodegradable materials.

3.3 Waste Minimisation Activities

Some re-use of solid waste occurs in RMI via scavenging at the waste depot and from piles of accumulating solid waste, however, the quantities of waste would be limited.

Recycling of aluminium cans was undertaken through a "Cans for Kids" program sponsored by Ministry of Education, run by the schools as a means to raise school funds, however, profitability was marginal and the program ceased. Majuro LG (Local Government) reported that it was keen to recommence the program. The lack of adequate containers for the deposit of aluminium cans has proved to be a significant obstacle to the development of an effective recycling program (Dever & Morrison,1997).

The potential for the recycling of other recyclables, such as plastic, glass, steel and paper, is quite limited due to the limited potential for economic returns for spent materials. High costs associated with transportation of recyclables to process facilities substantially impedes the potential of providing financially viable recycling services (Mechem II & Lovelace, 1996).

Traditionally, all food scraps and other edible organic wastes were fed to the family pigs, chickens and dogs. This still occurs at many rural households, however, in urban areas this practice did not appear that common now.

3.4 Waste Storage

The general public use communal bins to dispose of their waste, located around the urban areas. Bulk wastes are transferred directly to the disposal point by the owners / generator of the waste.

3.5 Waste Collection

In Majuro, domestic solid waste collection is a service provided by the Majuro Atoll Local Government (LG). No fees are charged for the service. The Majuro LG obtain funding via a local sales tax (primarily) and municipal fees for other activities. Currently the service does not encompass the whole atoll but only the major urban areas of Darrit, Uliga and Delap (DUD). Other residents on Majuro are required to manage their own waste, either on site or by deposition at the Rairok dump.

The Majuro LG waste collection service comprises of 50 bins and 2 heavy trucks. Each bin has a capacity of 1,500 ft^3, and is placed in DUD area (Rita to airport). Collection and transport of pins for emptying are made every two days. The efficiency of the collection equipment does not require any more front-end loader to collect the wastes. The system was implemented three years ago with the assistance of the Government of Taiwan. The system replaced the 2-wheel ex-army trailers (which used to be strategically located around the Majuro urban area, regularly towed to the waste depot for emptying).

The number of the bins is still inadequate to cover areas from the airport to Laura village. Therefore, people in these areas use deep holes on their lands for waste disposal.

The same system is also carried out on Ebeye Island in Kwajalein Atoll.

Other than Majuro and Ebeye, there is no public collection of solid waste in any other urban or rural areas within RMI. In these areas households and other premises dispose of their solid waste in a number of ways, including:

- transport to the nearest waste depot;
- management on site via burial, burning, and composting; and
- dumping into the lagoon and the sea.

3.6 Waste Disposal

Domestic solid waste collected in Majuro is disposed of at a waste disposal depot located on the ocean side reef flat at Rairok, several kilometres west of the central Majuro town area. The site was opened in 1997, and initially the anticipated life of the site was 6 - 8 months. However, the landfill is still operating (according to the contact in RMI EPA). The previous site was approximately one kilometre nearer to town, also located on the ocean side reef flat. Both sites, previous and present, involve containment of the landfilled waste through the use of wire cages (gabions) filled with coral, although some of the final areas of the old site do not have a gabion containing wall. The condition of the two sites indicated poor operations in regard to covering and compaction. The Department of Works, the authority responsible for operation of the depot, reported several problems operating the depot, including constant equipment failure and shortage of alternative machines, and lack of funding to purchase cover material (dredged sand from the lagoon @ \$15 / yd^3). Both sites have no form of leachate containment / management and as a result leachate seeps into the underlying reef flat as well as the ocean.

Access to the site is good due to being immediately off the main island road, however, vehicles unloading waste currently interfere with traffic along the main road.

There is currently no gatehouse to the site, however the site is fenced and secured from scavengers.

It was reported that the Ebeye waste disposal depot is a similar operation to the Majuro, however, the depot is located on the lagoon side of the island.

3.7 Management of Special Wastes

Medical Waste

The public hospitals and medical centres and one private medical practice generate medical waste in RMI. The quantity of waste generated has not been measured.

Medical waste generated at the hospital is currently managed by the hospital staff. Medical wastes from other medical facilities within RMI are taken to Majuro Hospital for disposal. Typical practices include burning in the Majuro hospital incinerator and burial at the local waste disposal depot. However, the incinerator is not working and they are using drums and gas to burn the waste.

Waste Oil

A regional study into waste oil estimated that some 400,000 L of oil is used each year in RMI. What proportion of this becomes waste oil is not known. The waste oil is primarily from the power plant, vehicle and heavy equipment maintenance and marine vessels. There is currently no facility for managing waste oil in RMI. MEC (automobile repair facility?) currently takes oil from the public for disposal and place in used oil tanks for use by Tobolar Copra Processing Plant.

The RMI EPA recently conducted an enforcement program to discourage garage owners from dumping oil on land out the back of the garage. Where this oil is now disposed of is not known.

Quarantine Wastes

Quarantine waste is generated at RMI's international airport and at the port facility in Majuro. Disposal practices for the waste is not known, however, it was reported that there is an incinerator at the Majuro airport, which is now defunct.

Motor Vehicle Batteries

The current practices for the disposal of motor vehicle batteries are not known. It is suspected that typical disposal practices include dumping at the Rairok waste depot and indiscriminate dumping.

In 1996 report, it is suggested that the RMI EPA sporadically picks up batteries from repair shops and stored them in a container. Apparently, no off-island shipments have occurred to date of the reporting.

Wastewater Sludges and Grease Trap Waste

Wastewater sludges are generated by septic tanks in areas not currently serviced by the sewerage system. Currently, there is no service / equipment to de-sludge the tanks. There is no monitoring of septic tank construction or operation, so performance and de-sludging practices are not known.

No information on grease trap waste was available. It is suspected that grease traps are not installed and grease is being discharged to the public sewerage system.

Asbestos

The Department of Health is unaware of any asbestos containing wastes in RMI.

Chemicals

Chemical use in Majuro and other urban areas is not known or regulated. As a result no information on waste disposal practices is available.

There is not a lot of industry within Majuro or other urban areas in RMI and as a result substantial quantities of chemical would not be expected.

Suspected disposal practices include deposition at the local waste depot, disposal on site, and via the sewer or septic tank wastewater systems.

Some years ago all old transformers containing PCBs were all removed by the US EPA.

4. FUNDING OF WASTE MANAGEMENT

Waste management infrastructure and services are funded by the Majuro Atoll Local Government (LG), which obtains funding via a local sales tax (primarily) and municipal fees for other activities.

The RMI government has also been working with several Asian countries to acquire financial assistance for a variety of projects, including waste management.

5. RELEVANT GOVERNMENT AGENCIES

RMI Environmental Protection Agency: Has regulatory jurisdiction over littering and waste management activities. RMI EPA also implements a public education program designed to heighten public awareness concerning waste management issues.

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Majuro Local Government (Parks and Ground Division): responsible for waste collection and disposal system in main urban areas in Majuro

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Ministry of Public Works (Ministry of Resources and Development): maintains responsibility for waste disposal activities, such as operation of disposal sites (Rairok)

Fax: (692) 625 3005,

Ministry of Finance: funding issues

Carl Hacker

6. SOURCES OF INFORMATION

Dever S. & Morrison J. (1997) AusAID Pacific Regional Waste Management Study – Republic of the Marshall Islands Country Report

Personal Communication (2001) John Bungitak RMI EPA

Mechem II, F.R. & Lovelace, N.L. (1996) "Republic of the Marshall Islands Majuro Integrated Waste Management Program – Conceptual Integrated Waste Management Plan" for Ministry of Resources and Development, Republic of Marshall Islands.

7. CONTACTS FOR FURTHER INFORMATION:

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Japan International Cooperation Agency

GUIDELINES FOR SOLID WASTE DISPOSAL SITE MANAGEMENT IN PACIFIC ISLAND COUNTRIES

COUNTRY REPORT ON URBAN SOLID WASTE MANAGEMENT

Federated States of Micronesia

1. STATE: KOSRAE

1.1 Waste Management Policy And Plan

There has been no current waste management Policy or Plan for the state of Kosrae as of yet. However, the Kosrae State Government is in the process of reviewing the following proposed Plans:

1. Proposed Solid Waste Management Plan: This Plan has been submitted to the Office of the Governor for endorsement. While the office of the Development Review Commission and the Department of Public Works await the Governor's endorsement of this Plan to become an official state document, funding sources are being solicited for implementation.

2. Proposed Environmental Management Plan for the Okat Harbour Industrial Area: This Plan has just been completed and transmitted to the Office of the Governor for his endorsement. Funding sources to implement this Plan are also being sought at the moment.

It has been indicated that it is likely that these Plans will become Official Plans for the State soon.

1.2 Relevant Legislation, Regulations, And Guidelines

Current legislation, regulations and guidelines which are relevant to solid waste management in FSM including:

- Environmental Pollution Regulation: this regulation generally prohibits pollution of the environment and thus provides civil penalties for such pollution. It became effective in August 2000.

- Littering (Kosrae State Code Title 13, Section 13.506): This provision prohibits littering in the State of Kosrae. Littering as defined in the Code is "throwing, dropping, or sweeping any waste on land or water, other than in appropriate storage containers or designated disposal areas." It should however be noted that landowners can't be guilty of littering on their own land.

- Fouling of Public Rivers and Public Water Supply (Kosrae State Code Title 13, Section 13.514): This specifically calls for the protection of Kosrae's fresh waterways.

1.3 Current Solid Waste Management Practices

1.3.1 Waste Generation

It was advised that there is no official data on wastes being generated or collected in Kosrae. Waste types can, however, be readily observed in all 4 designated disposal sites in Kosrae.

Both organic and non-organic wastes are being generated each day in Kosrae. Non Organic wastes are becoming a major problem faced by the State Government especially because of the limited knowledge on proper disposal. Most of the non-organic wastes are hazardous, and Kosrae State lacks the appropriate infrastructure, equipment, and appropriately trained staff to manage them.

1.3.2 Littering and Indiscriminate Dumping of Waste

Littering is a common problem in Kosrae. The existing Littering law should be more effectively and efficiently enforced than it is in order to better control and manage the littering situation in Kosrae.

The Kosrae Utilities Authority (KUA) suggested that littering and indiscriminate dumping occurs practically everyday. There are management and control measures in existence but lack means of enforcement. Very small population in the Kosrae Island makes enforcement of control measures difficult as individuals of the public knows each other.

1.3.3 Waste Minimisation Activities

Education Programs on Proper Disposal of Wastes and Environmental Management issues are constantly being undertaken by DRC Office to primarily raise public awareness. These programs include radio spots, news letters, public meetings and workshops and etc.

Aluminum can Recycling Program is also something Kosrae has been doing in the past years and it certainly helps in cleaning up the environment. This is a Kosrae State Government funded program, therefore its continuation is totally dependent on available government funding.

The Department of Public Works occasionally (usually on State observed international and local Events such as Earth Day, Environmental Day, Clean Up the World Day, etc.) collects and disposes wastes from the communities at designated disposal sites. Each community in Kosrae (four villages) also holds clean up activities during the special days.

Just recently, Kosrae State had found a way to minimize its collection and storage of waste oil in Kosrae. About 25,000 gallons of waste oils had been transhipped to Nauru to be used in the Phosphate Industry.

1.3.4 Waste Storage

At residential premises – there are four municipalities in Kosrae and only one Municipal Government is providing empty drums for each household.

At institutional premises – State Government provides drums etc. but seldom empty them.

At commercial and industrial premises – no storage receptacles are provided.

1.3.5 Waste Collection

As mentioned earlier, one component to the existing problem of waste management in Kosrae is the lack of an effective waste collection service. Kosrae does not have appropriate waste collection equipment to provide a collection service. However, the Proposed Solid Waste Management Plan addresses these concerns.

Individual households and commercial and industrial premises deliver their own garbage to the dump site.

Department of Public Works collects from the institutional premises.

Existing problems include:

- households without means of transporting waste to the nearest landfill site
- no systematic collection of waste;

1.3.6 Waste Disposal

There are four designated waste disposal sites in the four villages of Kosrae. Communities are encouraged to utilize these designated sites for waste disposal rather than disposing of waste at residential premises or

elsewhere. The Municipal Governments manage three of these designated sites while the Department of Public Works manages the fourth.

All four disposal sites in Kosrae are situated in the four Municipalities with the sites being managed by its respective Municipal Government, with the exception of one. Malem Dump Site is managed and operated by Malem Municipal Government, Utwe Dump Site is managed and operated by Utwe Municipal Government, Tafunsak site is managed by Tafunsak Municipal Government, but Tofol Dump site is managed and operated by the Department of Public Works under the State Government of Kosrae. Accessibility to all the sites is not a problem as they are situated in proximity to the main access road. The concern is the ineffective management of these sites. There is no full-time and trained employees at the sites to effectively manage or record waste types being disposed, no proper equipment for compaction and segregation of wastes, and/or handling and disposal of hazardous waste, no site security or fencing and etc.

KUA has identified that at the municipal dumps, any type of waste is allowed to be disposed of but at the Government managed site, some waste segregation occurs. Existing problems at the waste disposal sites include there is no management, enforcement, equipment, personnel, legislation and monitoring.

1.3.7 Management of Special Wastes

Medical / clinical waste

A medical waste incinerator had been installed for more than a year now and is used by the only hospital in Kosrae. The incinerator is however, located within the Kosrae State Hospital premises and thus public access to and near this equipment is not restricted.

Sludges / septage

There is not an island wide sewage system in Kosrae. Sludge from privately owned septic tanks can be removed at the owner's request and expense through the Department of Public Works. Sludges are released into "oxidation ponds". KUA has found that the sludges and septage are rarely picked up and disposed of properly.

Waste oil

There have been tremendous public education programs on proper disposal and management of waste oil. Repair shop owners, mechanics, industry personnel, fishermen, and members of the community had been encouraged to collect and transport waste oil to the Waste Oil Collection Bins at the Micronesia Petroleum Company Premise as well as storage containers at the Department of Public Works. As indicated earlier, Kosrae State had transhipped some 25,000 gallons of waste oil to Nauru earlier this year.

Quarantine waste

The national government are responsible for the management of quarantine waste.

1.4 Funding Of Waste Management

The following figures are from the Proposed Solid Waste Management Plan.

- The estimated cost of providing waste collection service in Kosrae is estimate to be US$72,000 annually.
- The estimated cost of establishing and operating the waste disposal site (as outlined in the Solid Waste Management Plan) is projected at approximately US$611,000 annually. This projection does not include leasing of private land(s) to be used as disposal site(s) as the Plan proposed and identified a government-owned land as the best option for disposal site. It is noted that the DRC Office and the new Administration (new Governor) does not see the land as an appropriate site.

- Under the Solid Waste Management Plan it is proposed that ongoing operation of the program will be paid for by applying an Advanced Disposal Fee and Deposits on imported aluminum cans, motor oil, car batteries, tyres and vehicles.

- The FSM National Government is currently negotiating with the US Agency for International Development (USAid) for a US$6.5 million grant for waste management in the FSM. FSM National Government has shown some interest in requesting that USAid fund the Kosrae Proposed Solid Waste Management Plan as a "Pilot Project." Other than this, no guaranteed funding has been secured for the SWMP.

- The office of the Development Review Commission has been doing environmental monitoring of all development projects within the State of Kosrae since its establishment in 1992. This Office is an Agency under the Kosrae State Government.

- No funding for closure and rehabilitation of the site has been specified in the Plan.

1.5 Relevant Government Agencies

Department of Public Works - The Plan proposed to establish a Solid Waste Management Division as a special part under the Department of Public Works. The Municipal government will no longer be responsible for solid waste management.

Development Review Commission: Will be responsible for environmental monitoring and assessment of the site.

Kosrae Utility Authority

1.6 Source of Information

Written by Andy S. George, Project Development Coordinator of Kosrae Development Review Commission (2001).

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2. STATE: CHUUK

2.1 Waste Management Policy And Plan

There is no specific policy on waste management in Chuuk and there is no legal waste management plans. However, police on other environment and public health matters dictated a general policy to keep the Chuuk State environment (air, water, land) clean and free from pollutants.

2.2 Relevant Legislation, Regulations, And Guidelines

Chuuk State Littering Law: Chuuk State Department of Public Works is responsible for operation and maintenance of dumping site. Chuuk Environmental Protection Agency is responsible for approval of new dumping sites only after an EIA is completed.

Chuuk EPA Solid Waste Regulations: Sets standards for the operation, location, penalty, etc for solid waste management in Chuuk State, including hazardous wastes.

2.3 Current Solid Waste Management Practices

2.3.1 Waste Generation

A Industrial & Commercial: 1.7 tonnes/day or 8.5 cu. m

B. Residential: 8.5 tonnes/day or 42.5 cu.m/day

C. Institutions: Information not available / not provided

2.3.2 Littering and Indiscriminate Dumping of Waste?

Littering and indiscriminate dumping of waste is a problem on Weno, the Centre of Chuuk State, especially along the roadsides and in the ocean.

There is a Littering Law for Chuuk State that the Department of Public Safety handles but not in full enforcement.

2.3.3 Waste Minimisation Activities

Education programs: Awareness through special events and school visits. Office is open to schools for questions.

Local waste material re-use eg. returnable bottles: None.

Recycling eg. aluminium cans: Chuuk Visitor's Bureau handles the recycling program of cans.

Other: Chunk cars (materials) used for artificial reef project by Chuuk State Government

2.3.4 Waste Storage

At residential premises: Kept in trash bags.

At institutional premises: Kept in trash bags.

At commercial and industrial premises: Stored in garbage dumpsters and then transferred onto flat beds that take the waste to the dump site.

2.3.5 Waste Collection

From residential premises: Each resident is responsible to dump their own waste at the designated dumpsite on Weno. Only a small portion of the residential area is served by Public Works as an experimental project

From institutional premises eg. schools, hospital: Same as above.

From commercial and industrial premises: Same as above.

Existing problems: Road to dump site is poorly maintained and does not provide easy access to the dump site.

2.3.6 Waste Disposal

Location: Weno, Neauo

Site access, condition of road: Poorly maintained (NOT all weather road)

Site gate house / office / amenities: None

Recording of waste types, quantities, vehicles etc.: None

Site services eg. water, power, sewer: None

Site geology / topography: Coastal area in mangroves/swamp.

Description of landfilling operation: Open Dump.

Equipment used: Bulldozer

Compaction and covering of waste: None

Types of waste disposed of at the site, restrictions enforcement: Almost anything. There are no restrictions and the enforcement is limited.

Site management, supervision and staffing: None

Site security (fencing): None (however already budgeted)

Stormwater management: None

Leachate management: None

Other environmental control measures eg. dust, noise, odour: None

Fire controls: None

Public health controls eg. insects and vermin: None

Environmental monitoring program: Twice a week

Public health inspections: Twice a weekly.

Existing Landfill Management Plan: None

Reporting: None

Recycling: Aluminium cans. Chuuk Visitor's Bureau handles this.

Separate management of garden waste: None

Handling and disposal of special wastes: Pesticides is not dumped at the dumpsite.

Proposal for closure and rehabilitation of the site: Had some funds given to Department of Public Works for maintenance & management of dumpsite.

Any existing problems: Access road and the maintenance of the dumpsite.

2.3.7 Management of Special Wastes

Medical / clinical waste: Hospital used to have an incinerator but it is not operational at this time.

Sludges / septage: Store in containment at Power Plant site.

Waste oil: Given to Thorfin (a ship) for fuel.

Quarantine waste: Incinerator at Airport terminal to destroy quarantine wastes

2.4 Funding Of Waste Management

Costs of providing waste collection services: Not known

Costs of establishing and operating the waste disposal site: Not known, only $100,000 was given to Public Works three years ago.

Mechanisms used for recovering costs eg. fees for waste collection, fees for waste disposal: None

Source of funds for paying for waste management services / activities, equipment, waste disposal site and any other infrastructure: Government

Funding for environmental monitoring: Government

Funding for closure and rehabilitation of the site: None

2.5 Relevant Government Agencies

Chuuk EPA: Established standards and enforce regulations, and assist other departments in solid waste issues.

Public Safety: Enforcement of littering law

Public Works: Implement operations and maintenance of solid waste management

2.6 References

WHO Report by Dr. H. Ogawa (unknown)

Response by Chuuk EPA (Joseph Konno, Executive Director) 2001

Dever S. & Morrison J. (1997) AusAID Pacific Regional Waste Management Study – FSM Country Report

2.7 Contacts For Further Information:

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2.8 Other

Chuuk is working with the FSM National Government to implement the POP Convention. This will hopefully help in improving the management of hazardous wastes in Chuuk and FSM.

3. STATE: YAP

3.1 Waste Management Policy And Plan

The Yap State Public Service Corporation has developed waste management policies and regulations.

3.2 Relevant Legislation, Regulations, And Guidelines

The Yap State Attorney General's office and the Public Safety Division enforce the State's littering laws, which forbid littering of any kind in public places.

The Yap State Environmental Protection Agency enforces the State's environmental laws, which regulate waste management and pollution sources.

3.3 Current Solid Waste Management Practices

3.3.1 Waste Generation

Information not available / not provided.

3.3.2 Littering and Indiscriminate Dumping of Waste?

Information on quantities not available / not provided.

3.3.3 Waste Minimisation Activities

Waste management responsibilities are becoming important issues in Yap State due to the recent enhancement of waste management awareness and the great combined efforts of both non-government and government agencies in promoting the waste management awareness. The environmental waste management related agencies have developed programs and put together organisations which support the government in educating and controlling waste management associated problems in the State of Yap.

Eco-tourism is also playing an effective role in waste management. Through eco-tourism training on the island, the awareness of waste management is being expanded and people are realising that waste management problems are everybody's problem.

Outside workshops, training, and programs in waste management are found to be more beneficial and effectively promote the awareness of the importance of waste management.

3.3.4 Waste Storage

Information not available / not provided.

3.3.5 Waste Collection

Information not available / not provided.

3.3.6 Waste Disposal

Information not available / not provided.

3.3.7 Management of Special Wastes

Information not available / not provided.

3.4 Funding Of Waste Management

Crippling the waste management programs and activities is the lack of funding assistance that the State Government may provide to successfully activate the programs. Therefore, these agencies and organisations rely on outside funding assistance through waste management related funding organisations.

Concerning shipping outside waste products/chemicals, the State Government relies on information sources from outside the State. Even if a reliable resource is found, funding assistance is still necessary to carry out the program. These are similar to the removal of waste oil products and expired or useless chemicals on the islands.

Outside experts or engineers are also necessary to assist the State in pursuing further effective assessments of our waste landfill, abandoned shipwrecks, and other type of wastes that may need assistance in order to effectively and successfully be eliminated, or controlled within Yap State.

3.5 Relevant Government Agencies

The Yap State Government has established a public landfill for waste disposal in the State of Yap.

The Yap State Department of Public Works & Transportation/State Government is responsible for maintaining the existing landfill site, to see that it is used properly by the public, government agencies, and private businesses.

The Yap State Public Service Corporation has taken over the operation and management of the sewer and water treatment plants from the government. In addition, the YSPSC has developed waste management policies and regulations, which monitor/regulate sewage and water treatment operations.

The Yap State Environmental Protection Agency enforces the State's environmental laws, which regulate waste management and pollution sources.

The Yap State Attorney General's office and the Public Safety Division enforce the State's littering laws, which forbid littering of any kind in public places.

In addition, various government agencies, such as Marine Resource Management Division, EPA, Health Services, Public Safety, and the Attorney General's office have worked together to develop, and are still developing waste management related programs and policies to improve the enforcement of littering regulations. Examples of such efforts include the removal/collection of car junks along public roads, removal of over-water toilets, and removal of private household dump sites around the Colonia area. The group is also performing other activities, in fulfilling the State Governor's executive order regarding the "Colonia Beautification Campaign".

3.6 References

Response from Yap EPA (Jason Rise, US Peace Corp Volunteer) 2001

3.7 Contacts For Further Information:

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Japan International Cooperation Agency

GUIDELINES FOR SOLID WASTE DISPOSAL SITE MANAGEMENT IN PACIFIC ISLAND COUNTRIES

COUNTRY REPORT ON URBAN SOLID WASTE MANAGEMENT

Nuku'alofa, Tongatapu, Tonga

1. WASTE MANAGEMENT POLICY AND PLAN

In March 2000, a Draft Solid Waste Management Plan (SWMP) was developed and this was adopted in the Island of Tongatapu (which includes approximately 70% of the population).

The overall objective of this SWMP is to provide the Government of Tonga with a practical, affordable, and sustainable course of action to improve the planning, management and regulation of solid waste generated within Tongatapu. Specific objectives of the SWMP include:

- Provision of a Plan which will deliver a waste management system that ensures that waste is collected, treated, and disposed of in a manner with maximum benefit to the health of the community and the environment, at the lowest practical cost;
- Provision of a Plan which reduces the impacts of current waste management activities on the community and the environment;
- To review and identify the most effective and appropriate options for waste collection and disposal, including the management of such operations;
- To reduce the quantity of waste requiring disposal, by changing community behaviour and developing appropriate and cost effective waste minimisation and recycling schemes, thus conserving resources and extending the life of ant new waste disposal facilities; and
- To educate relevant Government Officers about the goals, process and issues of solid waste management planning; and
- To develop local ownership of the SWMP by maximising the involvement of the relevant Government Officers in the preparation of the SWMP.

2. RELEVANT LEGISLATION, REGULATIONS, AND GUIDELINES

The Government of Tonga has no federal policy or plan for the management of solid waste generated in Tonga. Legislation and regulations on waste management is limited (and dated), and enforcement of legislative requirements / regulations is lax. Legislative and regulatory powers lie primarily with the Ministry of Health.

Legislation and regulations that address solid waste management in Tonga include:

- Town Regulations (Amendment) Act of 1974
- Garbage Act, (Act 11 of 1949, 14 of 1962, 27 of 1977, 8 of 1980)
- Public Health Act, (Part VI of Act 29 of 1992)

The *Town Regulations (Amendment) Act of 1974* makes it illegal to litter on any government roads, public places, beaches and properties of other persons. Under this Act offenders may be fined up to $T50 and/or imprisoned for up to 6 months, and could also be required to pay compensation of up to $T50 to any person injured as a result of the littering.

The *Garbage Act 1949*, as amended, defines garbage to include household refuse, empty cans, rubbish, trade refuse and waste, but not night soil. Section 8 of the Act requires every owner or occupier of a premise to keep garbage cans covered, clean, in good repair and easily accessible to the garbage collector. Garbage from premises must be deposited in garbage cans and not deposited on roadways, vacant land, foreshore, streams or creeks.

Part VI of the *Public Health Act, 1992* addresses Waste Disposal and provides the Minister for Health and its officers with a range of powers including:

- Making arrangement for the collection, transport and disposal of domestic, commercial and trade waste, and may charge the owner or occupier of the premises for these services;
- Requiring owners and occupiers of premises to provide and utilise suitable garbage bins (with cover/lid);
- Charging owners and occupiers of premises for the supply of garbage bins;
- Specifying requirements in relation to the storage and handling of waste materials on premises;
- Requiring waste collection to be undertaken twice per week;
- Making arrangement for street cleaning;
- Approving sites for the reception (disposal) of waste materials;
- Charging for the collection and reception of waste at an approved waste disposal site; and
- Issuing of fines for conviction of offences under the Act including for littering and dumping of solid waste and improper storage of solid waste. The fine may not exceed T$50 for an offence under the Act, and a further fine not exceeding T$5 per day for each day during which an offence continues after conviction.

According to the Ministry of Health (MoH) the process of obtaining a conviction for offences under the Public Health Act is cumbersome and slow, involving the issue of a notice and then pursuing the matter in Court, which can take many months. As a consequence the enforcement of the requirements of the Act is ineffective. In addition, there are only 8 public health inspectors on Tongatapu.

3. CURRENT SOLID WASTE MANAGEMENT PRACTICES

3.1 Waste Generation

In 1999 Sinclair Knight Merz (SKM) undertook a solid waste characterisation survey in Nuku'alofa as part of an EU funded project managed by SPREP. The following table summarises data from the survey including solid waste composition by volume (visual inspection) and by mass.

Table 3.1: Composition of Solid Waste (by Volume and by Mass) Disposed of at the Tukutonga Waste Disposal Site (August / September 1999).

Waste Type	All Solid Waste (Average % by Volume)	Domestic Waste (Average % by Volume)	Other Solid Waste[1] (Average % by Volume)	All Solid Waste (Average % by mass)	Domestic Waste (Average % by mass)	Other Solid Waste[1] (Average % by mass)
Mixed Waste (Domestic)	22.6	34.2	10.1	24.8	35.9	11.5
Paper and cardboard	29.7	12.2	47.3	19.4	7.6	32.0
Plastics	6.0	3.1	9.6	2.9	1.4	4.8
Glass	1.4	0.9	1.9	2.0	1.2	2.8
Metals	8.3	9.3	7.7	19.5	20.9	18.7

Waste Type	All Solid Waste (Average % by Volume)	Domestic Waste (Average % by Volume)	Other Solid Waste[1] (Average % by Volume)	All Solid Waste (Average % by mass)	Domestic Waste (Average % by mass)	Other Solid Waste[1] (Average % by mass)
Organics	29.2	37.4	20.0	21.6	26.5	15.3
Textiles	0.7	1.0	0.5	0.3	0.5	0.2
Hazardous	0.3	0.4	0.2	0.7	0.8	0.5
Construction	1.2	0.7	2.0	7.9	4.4	13.6
Other	0.8	0.8	0.6	0.8	0.7	0.9

Notes: 1. Includes waste from institutional, commercial and industrial premises, and construction and demolition activities.
2. Converting the % by volume results into % mass results were conducted using typical waste material densities obtained in Tchobanoglous et al (1993).

The results of the detailed sorting and characterisation of samples of waste taken from the MoH's waste collection truck are shown in Table 3.2.

Table 3.2: Detailed Composition of Waste Collected by Waste Collection Truck

Primary Waste Classification	Secondary Waste Classification	Average Percentage (wt%)	Primary Classification Average Percentage (wt%)
Paper and cardboard	Cardboard boxes	3.7	**31.3**
	Other – magazines, newspaper, office, tetrapak, packaging	5.3	
	Sanitary	22.3	
Plastic	Polyethylene terephthalate (PET)	1.0	**5.2**
	Rigid High Density Polyethylene (HDPE)	0.5	
	Flexible HDPE and other plastics	3.7	
Glass	All glass	3.3	**3.3**
Metals	Aluminium cans	1.9	**8.0**
	Other metals	6.1	
Organic	All organic	47.2	**47.2**
Textiles	All textiles including clothing, carpets and curtains	3.7	**3.7**
Potentially Hazardous	All	<1	**<1**
Construction and Demolition	All	1.0	**1.0**
Other	Including rubber and other	0.3	**0.3**
Total		100%	**100%**

The 1994 MoH study reported that the average daily waste generation in Nuku'alofa was about 0.5 litres/person/day or 0.7 kg/person/day. However, the WHO (1996) stated that they believed these figures to be on the high side as the waste characterisation study was only conducted over 5 days, and it should have been conducted over 8 days, discarding the first days results.

The results of 1999 study by Sinclair Knight Merz found that approximately 100 tonnes of solid waste is being deposited at the existing Tukutonga waste disposal site per week. Considering the likely catchment of the Tukutonga waste disposal site Sinclair Knight Merz estimate that the solid waste disposal rate in Nuku'alofa is approximately 0.8 kg/person/day (~300 kg/year). It should be noted that this is a waste disposal rate, not a

waste generation rate, as it does not include that waste that is managed on site eg. waste that is burned in the backyard, fed to household animals, or composted, or waste materials that are reused or recycled eg. beer bottles. However, using this estimated waste disposal rate, and assuming it applies to the whole of Tongatapu, the quantity of solid waste requiring management, off site, on Tongatapu is as shown in Table 3.3

Table 3.3: Existing Quantity of Solid Waste Requiring Management

District	Population (1999[1])	Quantity of Solid Waste (t/yr)
Kolofo'ou	17,209	5,163
Kolomotu'a	14,669	4,401
Vaini	11,349	3,405
Tatakamotonga	6,931	2,079
Lapaha	7,480	2,244
Nukunuku	6,253	1,876
Kolovai	4,098	1,229
Total	**67,989**	**20,397**

Notes: 1. Forecast based on 1996 census data.

3.2 Littering and Indiscriminate Dumping of Waste?

Littering and indiscriminate dumping of solid waste is a particular problem in and around Nuku'alofa, and particularly at the western end of the town (near Sopu), where a new waste disposal site was proposed but did not go ahead, and around the existing Tukutonga waste disposal site. Dumping of solid waste commonly occurs on any unoccupied areas. This includes mangrove areas, parks and reserves and vacant lots of land.

This practice of dumping waste on vacant land occurs across Tongatapu. Commonly waste that cannot be burned is dumped on the outskirts of a village. Some dumping into the ocean occurs. There is a fairly major but informal dumping ground on the southern side of the island, behind the agricultural research station, where dumping into the ocean also still seems to occur.

According to the Ministry of Health they have insufficient resources to combat the littering and dumping (there are only 8 public health inspectors to cover all of Tongatapu, undertaking a wide range of task, not only enforcement of anti-litter laws). In addition, the process of prosecuting those caught dumping solid waste is ineffective and involves firstly issuing a notice to clean up / remove the dumped waste and then taking the person to court if the waste is not removed. More often than not, the dumped waste is cleaned up after issuing a ticket to appear in court. However, often it is not possible to determine who dumped the waste.

The disposal of old motor vehicles and heavy equipment is a major problem on Tongatapu. Current disposal practices include indiscriminate dumping, disposal at the Tukutonga waste disposal depot, and dumping in the ocean (near shore).

3.3 Waste Minimisation Activities

Waste minimisation and recycling is critical to achieving a sustainable waste management system in Tongatapu. This is particularly so considering the lack of available land for landfill waste disposal and the ever increasing quantities of waste, in particular imported packaged goods, including vehicles, requiring local disposal. The results of waste minimisation could provide a valuable extension of the life of future landfill waste disposal sites (possibly as much as doubling the life, depending on the success of waste minimisation efforts).

The major recyclable / reusable components of the solid waste stream are as follows:

- Organic waste eg. garden waste and kitchen food waste (which comprises 30 – 50 % of solid waste stream);
- Paper and cardboard (>20 - 30% of solid waste stream);
- Metals eg. Al cans, steel cans, scrap steel, old vehicles and large steel equipment (10 - 20% of solid waste stream); and
- Other potentially recyclable materials eg. PET plastic bottles.

Currently there are a wide range of waste minimisation activities that are occurring on Tongatapu reducing the amount of organic waste, glass, metal, paper and building waste being disposed of to landfill. The following sections describe these current waste minimisation activities in more detail. The information was gathered by the RSA and the SWMA over several visits to Tongatapu.

Organic Waste

It is common practice on Tongatapu for domestic kitchen food scraps to be fed to family animals eg. pigs, chickens and dogs. This behaviour also extends to many commercial premises such as restaurants where staff take home the kitchen food scraps for their animals.

Composting of organic waste used to be a common practice on Tongatapu. However, not so long ago a program to discourage the composting of food and garden refuse was undertaken as means of controlling (reducing) rhinoceros beetle numbers. However, composting of organic waste does still occur in some villages. Typically the process involves composting in a hole in the ground, and using soil to cover the deposited waste to control vermin and insects.

The Tonga Trust has recently initiated a number of projects to encourage composting of organic waste on three islands. The project will encompass a series of workshops with selected community groups. The Trust also has educational material on composting written in Tongan.

A by-product of beer brewing is waste malt. According to Royal Beer they currently sell their waste malt to farmers for use as animal feed ($5.00 per bag).

Glass

The Royal Beer Company currently has a glass bottle reuse scheme for both beer bottles and locally produced soft drink (Zingo). To encourage the return the glass bottles Royal Beer pays $2.00 for all returned bottle crates and $0.10 per bottle for all returned beer bottles and soft-drink bottles. This scheme appears to work quite well, with few bottles and crates being disposed of at the Tukutonga dumpsite or dumped elsewhere. However, it was identified that Royal Beer is currently assessing the feasibility of using PET plastic bottles for both soft drink and beer, as a means of increasing market share, and consequently profits. If this were to occur there would be very significant increase in the quantity of plastic soft drink bottles requiring disposal on Tongatapu.

Unfortunately the Royal Beer company cannot reuse imported beer bottles because the bottles are a different shape to beer bottles used by Royal and they cannot be refilled. However, it is noted that most imported beer is packaged in aluminium cans.

Coca-Cola used to have a glass bottle reuse scheme similar to that of the Royal Beer Company, however, this scheme was phased out in favour of PET plastic bottles due to the high cost of transporting the glass bottles back to Fiji for cleaning and refilling.

Consultation with a local recycling company in Tonga, Moana Recycling, identified that export recycling of waste glass eg. bottles and jars, are not currently economically viable ie. the cost of collection and export of the glass exceeds the market value of the collected material.

Plastics

A scheme for the collection and recycling of PET plastic drink bottles was established by Coca Cola in early 1999. The scheme involved establishing a number of recycling bins located around Nuku'alofa, and export of the collected PET to Australia for recycling. Coca-Cola funded the cost of the recycling bins and also funded television advertising to encourage people to use the recycling bins. However, consultation with Coca-Cola and Moana Recycling (the company contracted to collect and export the PET) identified that although operating for some time no PET has yet been exported for recycling. Moana Recycling advised that other than selected non-ferrous metals eg. aluminium cans, no other waste materials can currently be viably recycled ie. the cost of collection and export of the material exceeds the market value of the collected material. A simple analysis of shipping costs and likely market value of recycled PET in Australia confirmed this to be the case for PET plastic drink bottles.

A survey of households in Nuku'alofa undertaken by Sinclair Knight Merz (1999) identified that a significant number of people reuse plastic drink bottles and other plastic containers for a range of liquid storage purposes. Another example of local waste reuse is the purchase of mineral turpentine from a local hardware store.

Metals

A number of organisations and people currently collect aluminium cans for recycling, however, there appears to be only one primary company which exports the cans for recycling, Moana Recycling. Even so, this company's operations occur in the backyard of a private residence. There is no formal system for the collection of the cans. Moana Recycling advises that the primary source of its cans include the major hotels in Nuku'alofa and purchase from local scavengers at the Tukutonga dump site.

Moana recycling also export other valuable non-ferrous metals for recycling, including copper and brass, however, the quantities are small.

At the time of speaking to Moana Recycling (August 1999) export recycling of lead and ferrous scrap (steel cans, scrap steel, iron) was not economically viable. There is however some local reuse of vehicle battery lead. Fishermen intermittently visit commercial premises to collect the lead cores from the vehicle batteries and melt them down for sinkers and weights for fishing nets. The remaining battery material is then disposed of at the Tukutonga waste disposal site.

In regard to export recycling of metals, most material ultimately goes to Japan or Korea for reprocessing, and according to Moana Recycling the Japanese and Korean companies are not interested in small quantities (<2,500 tonnes). As a consequence, Moana Recycling has to deal with a "consolidator", Simsmetal and Non-Ferrous Pty Ltd, in Australia.

A common practice locally is the reuse of empty 200L (44 gallon) steel drums as garbage bins. Another example of local metal reuse is automotive parts. However, the current system is rather ad-hoc and not overly effective. There are a few large car parts dealers but small automotive repair shops hold many of the old scrap cars, which often makes sourcing parts very difficult. In addition, there is competition from the importation of second hand car parts from Japan.

Paper and Cardboard

There are only a few examples of paper and cardboard waste minimisation on Tongatapu and this is reflected in the large quantity of paper and cardboard being disposed of at the Tukutonga waste disposal site.

According to Moana Recycling export recycling of waste paper and cardboard is not currently economically viable.

Aloua ma'a Tonga has a paper making initiative that recycles paper, however, the paper requirements for this enterprise are quite small at this stage.

Other

Used vehicle tyres are commonly cut up and used as pot plants. They are also occasionally used to fire traditional underground ovens.

3.4 Waste Storage

Residential Premises

The handling and storage of solid waste at residential premises varies depending on the method of disposal. Those households that utilise the waste collection service typically store their waste in plastic bags and pandanus baskets on a timber stand (of varying height), that is located adjacent to the street. The purpose of the stand is to keep the waste out of reach of local roaming animals eg. pigs, dogs and chickens. This sort of storage is not in accordance with the requirements of the Ministry of Health but appears to be considered acceptable by them, as it is very common. Some of the problems with this method of waste storage include:

- the waste is exposed to weather and prone to being blown about during windy and stormy weather;
- the waste is exposed and attracts vermin and insects, possibly creating unsanitary conditions as well as creating odour nuisance, particularly if the waste is not regularly collected;
- this type of storage is not particularly aesthetically pleasing.

Another common waste storage practice is to utilise a 200L (44-gallon) drum to store waste. Typically the drum is cut in half.

The lack of a secure lid, (to prevent animals and vermin) and the heavy weight of the bins are obvious problems with this bin type.

Some of the more wealthy households have purchased a garbage bin. Some are plastic bins with wheels and some are simple traditional steel or plastic cans.

At some households the waste is simply placed adjacent to the street in plastic bags or in pandanus baskets.

Households that do not utilise the waste collection service also undertake a range of waste storage practices including:

- stockpiling in the backyard for later burning. Sometimes this is undertaken in a pit / hole in the ground; and
- storage in plastic bags, cardboard boxes, and pandanus baskets prior to taking to the Tukutonga waste disposal site.

Households in villages remote from the Nuku'alofa Tukutonga waste disposal site also undertake a range of waste storage practices but the most common practice is piling in the backyard for later burning, which typically occurs in the evenings and / or on Saturdays.

Commercial and Industrial Premises

Similar to residential premises, the storage of solid waste at commercial and industrial premises varies greatly from premise to premise. The most common practice appears to be the use of empty 200L (44-gallon) steel drums. These present the same problems as when used at residential premises. Some premises utilise large 240L plastic bins with wheels. This includes the Talamahu Market in Nuku'alofa, Friends Cafe, and others. This type of waste storage container appears to becoming more and more popular, and it is compatible with the Ministry of Health's bin lifting system on the waste collection truck.

At some commercial and industrial premises solid waste is simply placed on the ground at the rear of the premise. This is sometimes in plastic bags and sometimes in no container. Such practices can lead to unsanitary conditions depending on the type of waste and how regularly it is removed and disposed of.

3.5 Waste Collection

Residential Premises

In Nuku'alofa and surrounding urban areas domestic solid waste is collected by a service provided by the MoH for a fee of T$0.50 per month. Use of the waste collection service is not compulsory and households using the service are required to pay the Ministry of Health on a monthly basis.

According to the Ministry of Health the service currently collects solid waste from approximately 950 households, of a total of approximately 4,900 in Nuku'alofa and the surrounding urban area (approximately 20% of households). The service involves the kerbside collection of household solid wastes on a weekly basis using one compactor-type garbage collection truck. The service used to collect wastes twice a week but due to the failure of one of the two collection trucks, and budgetary limitations, the service has been limited to collection once per week. The collection trucks were donated by the Australian Government and are now approximately 14 years old. They are single rear axle, compactor type waste collection trucks, with an approximate capacity of $15m^3$. According to the Ministry of Health, due to the age of the trucks the single remaining vehicle is unreliable and requires a significant amount of maintenance.

The garbage truck is operated by a crew of 3 (driver and 2 labourers). There are two shifts per day and the truck operates 6 days / week. Considering the number of premises serviced and assuming that households are serviced once per week and that all commercial and industrial premised are serviced occur every day, the single collection vehicle services approximately 1,800 premises per week (or 150 premises per shift). This is very low. According to the WHO (1990, 1992, & 1995) the waste collection service is not very efficient and they recommended that the service be privatised to improve the efficiency of the service.

A survey of more than 50 households within Nuku'alofa indicated a strong demand for waste collection service by households not currently on such, however, due to the limited resources, equipment and funds the Ministry of Health is unable to expand the service.

There is no government collection of solid waste in any other areas on Tongatapu. In these areas households and other premises are responsible for disposing of their wastes. This is done in a number of ways, including taking to the Tukutonga waste disposal site (common for households in Nuku'alofa), burning (mostly), burial, composting, and dumping onto low-lying land, the lagoon and the ocean. However, it is understood that some rural villages have recently implemented there own waste collection service, operated by the village community using community vehicles to take the waste to the Tukutonga dump site.

Institutional, Commercial and Industrial Premises

Institutional, commercial, and industrial premise may all make use of the Ministry of Health's waste collection service. According to the Ministry of Health approximately 80 schools, 40 motels and restaurants and 30 industrial premises currently utilise the waste collection service. Many institutional, commercial and industrial premises do not use the waste collection service, due to the lack of resources and the waste collection service is unreliable.

The regularity of waste collection services to institutional, commercial and industrial premises varies, but many commercial premises receive the service every day. This includes the Talamahu Market, motels, restaurants and hostels.

Charges for the waste collection service vary from $1.50 - $2.00 per month.

Those premises that do not receive / use the waste collection service must organise and undertake their own waste collection and disposal. Studies have indicated that some businesses pay more than $35.00 per week and that these businesses are keen to utilise the waste collection service but cannot due the Ministry of Health's inability to expand the service.

Institutional, commercial and industrial premises which are remote from Nuku'alofa have to manage their own waste. Common practices include burning and burial on site.

Construction and Demolition Sites

Very little solid waste requiring disposal is generated by construction and demolition activities as the waste materials are mostly re-used or recycled, either by the builder or by scavengers. Waste materials that do require disposal are taken direct to the Tukutonga waste disposal site by the generator or buried on site.

Public Areas

Environmental Planning Assessment and Conservation Section of Tonga Ministry of Lands Survey and Natural Resources (EPACS) is responsible for the management of most public parks and reserves on Tongatapu. This includes the Vuna Road Waterfront area. Any litter in this area was collected by EPACS, however, an initiative of the Tongan Chamber of Commerce saw the installation of litterbins along the waterfront. The bins are located between Popua and Sopu and were emptied daily in the morning. A local rugby team was paid a set amount to empty the bins as well as collect the litter between the bins. The collected rubbish was tipped in the Tukutonga tip. Asian Paints donated the rubbish bins, and other industries (approximately 15) within the Chamber contributed money to run a television advertising campaign to encourage people to place their rubbish in the bins. The initiative commenced in May 1998 and discussions with the Chamber of Commerce indicate that it has helped to reduce the littering along the beachfront. Initially many people were using the bins for their domestic rubbish and the bins were spilling over; although this is still a problem at times, the amount of such rubbish has now stabilised.

Unfortunately, the funding for the project was only available for one year ($1,500 for materials and $13,500 for labour), after which the service ceased. EPACS staff now empties the garbage bins.

The Ministry of Health undertakes cleaning of Taufa'ahau Road, between Vuna Road and the Tonga Electric Power Board building. This is undertaken 6 days per week, in the morning and evening. The Ministry of Health has one full time person to undertake the street cleansing operations, although the waste collection crew assists during the morning shift.

In October 1999, the village of Ha'ateiho installed a large number of litter bins along the Taufa'ahau Road, all the way through their village, as part of the preparations for the new millennium. The bins are being emptied by a local youth group. Collected waste is disposed of at the Tukutonga waste disposal site.

3.6 Waste Disposal

Waste disposal practices on Tongatapu include:

- Disposal at the Tukutonga waste disposal site;
- Burning and / or burial on site; and
- Littering and indiscriminate dumping of waste.

Tukutonga Waste Disposal Site

Solid waste generated in Nuku'alofa and nearby villages is disposed of at a waste disposal site located on the fringe of the urban area, approximately 4 km east of Nuku'alofa town centre (next to Tukutonga village). The site is located within a mangrove area, on the edge of a Fanga Kakau lagoon.

Observations in February 1997, indicated that the landfilling operation commenced as an area style filling operation, pushing into the mangrove. World Health Organisation (WHO) funded a program in 1996 aimed at upgrading the landfilling operation to a trench style operation, excavating into the previously deposited waste, and semi-regular weekly / fortnightly covering of the deposited waste using contractors. The Ministry of Health had no landfilling equipment of its own.

As part of the WHO program a gravel access road into the site was constructed. A gatehouse was also constructed for site staff, which included a toilet with a septic tank.

WHO funding ceased at the end of 1996 and based on visits to the Tukutonga waste disposal site in August 1999 and November 1999, the landfilling operation has reverted to a poorly controlled unsanitary dumping operation.

Even though the site is supervised by Ministry of Health staff, the dumping of waste still occurs in a haphazard manner. There is no landfilling equipment based at the site and consequently the waste is not compacted or covered on a regular basis. Considering the very large quantity of exposed garbage at the site it would appear that it has been quite some time since landfilling equipment was operated at the site.

Although the site has a gravel access road, much of the time the road is covered in garbage because during wet weather garbage is dumped directly onto the road as the vehicles are unable to access any other parts of the site. According to a vehicle survey undertaken by in 1996, 300 – 400 vehicles access the site each week.

Scavenging is very common at the site as access to the site is uncontrolled (there is no site fencing) and there are a large number of pigs and dogs which feed off the deposited waste.

There are few measures undertaken at the site to control or prevent environmental impact ie. no regular compaction and covering of the dumped waste, no stormwater controls, no leachate controls, nor any management plan for the site. It would be expected that local groundwater, surface water (Fanga Kakau lagoon) and the mangroves are being affected by the dumping operation. In addition, the NZ High Commission reports that the site regularly catches on fire.

The waste disposal site is bounded by Tukutonga village to the east, Popua settlement to the south and the NZ High Commission compound to the west. All these premises are currently being impacted (by odour, fire smoke, litter, vermin and insects etc) by the waste disposal site operation.

A new solid waste disposal site at Tapahio has been designed and will be implemented in the next few months. This landfill site has been designed with the aid of AusAID and Australian solid waste landfill engineers.

Burning and Burial

It is common practice both in Nuku'alofa as well as in villages on Tongatapu to burn or bury waste. Many households have a pit / area in their yard where household waste, garden waste, paper, cardboard, plastic and other combustible waste is burned. This is often the case even when a household receives the waste collection service.

Issues associated with these practices include:

- Health effects of burning plastics and other synthetic materials which generate smoke and toxic fumes;
- The nuisance created by the smoke – most burning occurs in piles, which often contain wet materials, and is very inefficient; and
- The attraction of vermin and insects, if the burning is not undertaken regularly.

3.7 Management of Special Wastes

Although no special waste characterisation studies have been undertaken, special wastes that are being generated on Tongatapu are as below.

Medical Waste

Sinclair Knight Merz (1999) undertook an audit of the Vaiola Hospital's waste management system in August 1999. The findings of the audits included:

- All sharps and pathological specimens are separated and disposed of at the Ministry of Agriculture and Forests' quarantine waste incinerator that is located at the main shipping wharf in Nuku'alofa. The

separated waste is generally stored at the hospital and transported to the incinerator for disposal approximately twice per month. The Ministry of Agriculture and Forests charge the Ministry of Health $0.40 / kg of waste burned;

- Large body parts are returned to the family for burial at home. It was not identified what happens to small body parts, but Sinclair Knight Merz suspected that they were likely disposed of with the general solid waste;

- Kitchen food waste is shared among kitchen staff and taken home for feeding family pigs;

- All other waste is deposited in general garbage bins located around the hospital (approximately 10 bins were identified). The bins are regularly emptied by the Ministry of Health waste collection service and the waste is disposed of at the Tukutonga dumpsite. Wastes identified in the bins included packaging waste, office waste, nappies / diapers, swabs and bandages, and one syringe (with needle covered);

- No information on the quantities of medical waste generated at the hospital was identified.

According to the Ministry of Health the disposal of medical waste from private medical practices within Nuku'alofa is the responsibility of the waste generator ie. the medical clinics. The current collection and disposal practices are not known but may involve using the waste collection service provided by the Health Department.

Septage and Sludge

Septage and sludge are generated by septic tanks (septage) and other sewage / wastewater treatment plants within Nuku'alofa and the surrounding rural areas. Currently, septic tanks and wastewater treatment plants are de-sludged on an as required basis ie. generally when the tank is full of sludge and the tank blocked. De-sludging is undertaken by the MoW who have two tankers in Nuku'alofa. The fee for the de-sludging service is approximately $20.00 per service.

Collected septage and other sludge are disposed of at a sludge drying / disposal facility located immediately adjacent to the Tukutonga dumpsite (on the eastern side of the site), and adjacent to the lagoon / mangrove. Sludge drying is achieved via drying beds, which comprise concrete block walls constructed on a sandy bed. There are separate dedicated sludge drying beds for the commercial and industrial sludge. The water in the deposited septage and sludge evaporates, drains through the sandy base and into the adjacent mangrove, and overflows during rainfall. The dried sludge is made available to the community for free.

The Ministry of Works' reported that some septage is applied onto some agricultural lands, direct in liquid form, as part of the land preparation process, prior to planting. According to the Public Works this is generally done at night. The reason for this, according to the Department of Agriculture, is that the concept is not likely to be well accepted locally and may affect crop sales.

Grease traps are not used in Nuku'alofa and therefore grease trap waste is not generated. The grease in wastewater (particularly from commercial food premises) would be entering the premise's septic tanks and is probably flowing out with the effluent (into the adjacent ground), although some grease would likely be building up in the tanks and is probably removed when the tanks are de-sludged.

Quarantine Waste

Quarantine waste is generated at Tonga's international airport and at the Queen Salote wharf facility in Nuku'alofa. According to Ministry of Agriculture and Forests there are 2 quarantine waste incinerators on Tongatapu:

- The Ministry of Agriculture and Forests's quarantine incinerator at the Queen Salote Wharf, Nuku'alofa;

- The Ministry of Agriculture and Forests's quarantine incinerator at the Fua'amotu International Airport;

Conflicting information was obtained about the operational status of the quarantine incinerator at the Fua'amotu International Airport. Consequently it is uncertain whether it is operational or not.

The two quarantine waste incinerators were supplied under the AusAID funded Tonga Quarantine Project and are "Universal Model 2" manufactured by Universal Incinerators Australia Pty Ltd, Berkeley Vale, NSW Australia. The Standard Model 2 Incinerator is a basic oil-fired (diesel) incinerator complete with primary and secondary burners, and all necessary controls for manual operation. The incinerators have burning capacity of approximately 72kg/hr of general hospital or general office waste. They are also capable of destroying wet materials and pathological waste. Garbage with a high calorific value generally requires little diesel fuel once the burning has commenced. According to Ministry of Agriculture and Forests approximately 1000kg of quarantine waste is generated per week at the airport. The quantity of quarantine waste generated at the wharf varies. The Ministry of Agriculture and Forests advised that they do have spare capacity to incinerate additional medical waste or other waste, but that this capacity varies. Ministry of Agriculture and Forests charge for waste incineration is $0.40 per kilogram ($400 per tonne).

Waste Oil

Although not a solid waste, waste oil has been included in the SWMP as waste oil is commonly disposed of with solid waste.

According to a regional study into waste oil, undertaken by the United Nations (1996), it is estimated that some 460,000 L of oil is used each year in Tonga. What proportion of this becomes waste oil is not known. There is currently no facility for managing waste oil in Tonga. Current practices for disposal of the waste oil are not known, but suspected practices include dumping at the Tukutonga dump site, pouring into drains, the lagoon, the sea, and onto vacant land.

The Ministry of Marine and Ports are in the process of establishing an incinerator at the main shipping wharf for the disposal of waste oil generated by an oily water treatment facility (which treats bilge / tank water from ships). According to the Ministry the capacity of the incinerator is 5kg of sludge per hour and 30L of waste oil per hour. There is the potential that this facility could be used for disposing of waste oil generated on Tongatapu.

Motor Vehicle Tyres and Batteries

Old vehicle tyres present a waste disposal problem. They are difficult to landfill (to compact) and if stored present an excellent breeding ground for insects. There are no special facilities on Tongatapu for the disposal of old tyres. It is the responsibility of the vehicle owner to dispose of old tyres. Common waste disposal practices include:

- Dumping at the Tukutonga dump site;
- Reuse in the garden;
- Use as fuel for traditional underground ovens (for large events); and
- Storage / dumping on vacant land;

The current practices for the disposal of motor vehicle batteries are not known, however, some motor vehicle batteries were being recycled by a private company in Nuku'alofa, which recovers the lead for export to recycling markets. The means of disposal of the battery acid and plastic case are not known. It is suspected that typical disposal practices include dumping at the Tukutonga dumpsite and indiscriminate dumping.

Shipping Waste

The information is not provided for what currently happens with solid wastes from both local and international shipping activities. According to the MARPOL agreement, all member states must provide reception facilities for solid waste (garbage) from ships. Tonga is a signatory to MARPOL.

However, it is known that the Ministry of Marine and Ports recently commissioned an incinerator to dispose of waste oil and sludge generated by a new wastewater treatment plant that is used to treat oily wastewater generated by docked ships.

Other

Household hazardous waste (HHW) includes such waste products as old paint, residual garden pesticides and herbicides, dry cell batteries, and household cleaners.

Commercial food and animal waste includes by-products of local food processing operations eg. fish processing, off specification or expired products, offal / slaughterhouse waste, and other wastes which are usually highly odorous.

There are no facilities available for the separate disposal of household hazardous wastes or commercial food and animal waste. The wastes would be disposed of with general solid at the Tukutonga dumps site.

4. FUNDING OF WASTE MANAGEMENT

Waste Collection Costs and Charges

According to Sinclair Knight Merz (1999) the Ministry of Health has a budget of approximately $60,000 per annum to operate the waste collection service and to maintain the Tukutonga waste disposal site. According to the Ministry of Health approximately 60 - 70% of this money is spent on the waste collection service ie. $35,000 - $45,000 p.a.

The revenue raised by charges for the waste collection service for 1998 – 99 are as shown in Table 4.1

Table 4.1: Income from Waste Collection Fees 1998 – 99

Type	Total Number	Rate per Month ($)	Total Income per Year ($)
Private Home and Office	951	0.50	5,706
Schools and Stores	79	1.00	948
Restaurants, Motels, Hotels, Guest Houses	41	1.50	738
Whole Store Industries	31	2.00	744
Total ($)			**$8,133**

Source: Sinclair Knight Merz (1999)

It can be seen from Table 5.1 that revenue collected by fees for the waste collection service are significantly less than the costs of providing the service. The revenue is in fact only 20% of the waste collection costs. Consequently, the Government of Tonga is heavily subsidising the cost of providing the waste collection service, to both residential premises and particularly commercial and industrial premises. According to Sinclair Knight Merz (1999) the fees for waste collection are dictated by legislation and have been the same since 1977. A survey of more than 50 households indicated that many households want to receive the waste collection service and that many households were willing to pay more than the current $0.50 per month. Some households were willing to pay as much as $5.00 per month.

5. RELEVANT GOVERNMENT AGENCIES

Ministry of Health – currently has legislative responsibility for the management of

Department for Environment – currently responsible for environmental matters

Ministry of Lands Survey and Natural Resources – currently responsible for land planning

Ministry of Works – will be responsible for the management and operation of the new Tapuhia Waste Management Facility

6. SOURCES OF INFORMATION

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Japan International Cooperation Agency

GUIDELINES FOR SOLID WASTE DISPOSAL SITE MANAGEMENT IN PACIFIC ISLAND COUNTRIES

COUNTRY REPORT ON URBAN SOLID WASTE MANAGEMENT

South Tarawa, KIRIBATI

1. WASTE MANAGEMENT POLICY AND PLAN

The current waste management policy and plan is under preparation as part of the Sanitation, Public Health and Environmental Improvement (SAPHE), a national loan project from the Asian Development Bank (ADB). Two consultants are currently working with the Government to assist in the formulation of such a plan.

SAPHE will improve the development potential of South Tarawa and the public health of its population through a sustained program and physical out-put of improvements in water supply, sanitation and sewerage, and solid waste management and environment conservation. The latter aims to improve and promote efficient solid waste management. The following are likely components of the plan:

1. Capacity and capability of Councils to collect waste will be enhanced through procurement of better and appropriate vehicles/machineries as well as training of relevant staff for operation and management of dumpsites

2. Provision of refuse containers to every household for effective collection systems

3. Proper siting of landfills with appropriate designs (features) and capacity for at least five years along the island of South Tarawa

4. Reducing volume of waste at source, through re-use and recycling, (composting) all items (PET Bottle, cardboard, scrap metal, etc). Improvement of present aluminium recycling facilities and transport to external recycling centres. Establish on-site recycling facilities at landfills

5. Introduce relevant legislation to govern all of the above

2. RELEVANT LEGISLATION, REGULATIONS, AND GUIDELINES

Pollution and waste management is covered by fragmented legislation such as the Public Health Ordinance 1926 and Regulations 1926, Harbour Ordinance 1957 and Regulation 1958, Foreshore and Reclamation Ordinance 1969, Local Government Act 1984 and Council Bye-laws to name a few. Quite recently, a more comprehensive legislation had been enacted to prevent, control and monitor pollution. The following is legislation relevant to waste management.

(i) Physical planning and assessment is covered in many pieces of legislation including the Public Highway Protection Act 1989, Land Planning Ordinance 1973, Foreshore and Land Reclamation Ordinance 1969 and Town Council Bye-Laws for Parks, Recreation, Grounds and Buildings. The responsibility of land use planning is shared between the Local Councils and the Land Planning Boards of the Ministry of Home Affairs and Rural Development (MHARD) through its Land Management Division (LMD). Establishment of Waste sites is therefore also considered under land use planning but because sitings are mostly along the coast, the Foreshore and Land Reclamation legislation governs it as well to some extent.

(ii) The Public Health Regulations prohibit deposition of a receptacle in any public area and leaving receptacles at any premises, more or less to avoid breeding of disease vector insects. The same regulation requires all premises and land to be kept clean and rubbish must be burnt if possible or put readily in bins for daily collections.

(iii) There is general prohibition of depositing litter or rubbish on the public highway in the Public Highways Protection Act 1989.

(iv) The Local Government Act provides for sanitary services dealing with rubbish and the prohibition of acts detrimental to the sanitary condition of the area. Littering of villages and public places and the sea in the Council (Public Health) by-laws is also prohibited.

(v) Kiribati Environment Act 1999 (enacted 2000) has four main objectives, three of which are related to pollution control; establishment of systems for control, prevention and monitoring of pollution; and reduction of risks to human health and ultimately prevention of environmental degradation. The Ministry of Environment and Social Development (MESD) is solely responsible for implementation through its Environment and Conservation Division (ECD). As yet no one has been prosecuted under this Act. To date, the ECD has been working on training and developing a system for environmental standards, auditing, licensing and compliance to implement the Act. The major constraint to this has been resources (financial and staff).

3. CURRENT SOLID WASTE MANAGEMENT PRACTICES

3.1 Waste Generation

It was estimated (SPREP/Sinclair Knight Mertz, 2000 & OEC, 2000) that waste volumes generated from households and others (domestic and commercial) in South Tarawa was approximately 3,500 tons per annum, domestic waste generation rate is 0.33 kg/capita/day and bulk density was estimated as 130 kg/m^3. The characteristics of domestic waste are shown in Table 3.1

Table 3.1: Summary of Domestic Waste Composition Surveys (Wt %)

Classification	1994	1996	1997	2000
All organics	80	62	76	51.3
Papers	2	14	5	7
Plastics	2	12	5	7.2
Glass/Ceramics	3	-	3	13.6
All Metals	7	7	10	9.4
Textile/Rubber	<1	3	<1	3
Miscellaneous	6	2	-	8.5
Total	100	100	100	100

NOTES:

1. 1994 and 2000 are based on household surveys done by Gangaiya (1994) and Sinclair Knight Mertz (2000) respectively.
2. 1996 is based on Waste Dumpsite survey at Red Beach Dump, done by PPTA (2000)
3. 1997 was undertaken by ISEU for ADB
4. The general trend for usage for plastics, paper and metal (aluminium cans) indicated an increase (SPREP/Sinclair, 2000).

(adapted from Table 2.1, page 3 of OEC, 2000)

3.2 Littering and Indiscriminate Dumping of Waste?

Solid waste disposal is a serious and increasing concern in Kiribati, particularly the capital, South Tarawa. Although regulations forbid littering, the lack of enforcement and inability of responsible authorities to ensure proper waste disposal has caused the capital to be generally littered, thus reducing aesthetics and degrading the environment.

The limited resources allocated to relevant authorities, together with the lack of concern and sense of responsibility by the public to manage waste appropriately in communal or public areas has resulted in poor management of waste. However, at individual's private properties, waste is better managed because both daily sweeping of compounds and composting are commonly practised.

With the capital urbanisation, overcrowding and increased dependence on imported goods whose packaging is not biodegradable, makes South Tarawa an unsightly place. In comparison, in rural areas where responsibilities for managing waste at public places and private property rest on caretakers and landowners respectively, has resulted in better management.

3.3 Waste Minimisation Activities

Weekly radio programs and other means of raising public awareness are run by both government and environmental organisations. This includes workshops on waste management. Workshops for all sectors of communities like religious groups, councils, women and youth groups have been held. Annual environmental days with various competitions, clean-up weekends such as World Clean-up Days, are also run to raise environmental awareness throughout South Tarawa.

The reuse of items such as plastic bags, bottles and other reusable containers has been practised by the local people in many ways, far beyond the expectations of waste management authorities. A visit to any household to make an inventory of what is reused would result in an extensive list and would typically include:

(i) Battery chemicals as soil fertiliser, dyes for mat weaving leaves, kids' toys, etc. Local farmers found that battery contents had improved the soil fertility yet no scientific research has been cited.

(ii) Car tires: used as coastal protection/walls, washing and bathing tubs, hammocks, roof weights against strong winds, children's toys, domestic animal's eating plates, etc.

(iii) Bottles: used for liquid (traditional juice and body oil, kerosene, etc) storage containers, dug-in decorations on ground around compound.

(iv) Plastic bags: rewashed and used more than once as shopping bags. Re-used as rubbish bags

(v) Aluminium roof sheets: garden walls, domestic animals enclosures, roofing extensions of traditional cooking huts (separate from main living house),

Metal recycling of aluminium cans is currently being undertaken on Tarawa by two private enterprises. It is likely to expand in future as imports for beer and soft drinks increase. However, continual break-downs of the balers may discontinue this recycling process in future.

Paper, plastic and other recyclable items are still considered for potential recycling, but feasibility studies need to be undertaken first.

In a study by Sinclair Consultants (2000), opportunities and obstacles for waste minimisation in Tarawa are highlighted as shown in Table 3.2 below:

Table 3.2: Opportunities and Obstacles for Waste Minimisation in Tarawa.

OPPORTUNITIES	OBSTACLES
Home composting (ideal for geology and island environment) has already been done and will continue as community schemes	Lack of funds for waste management initiatives (eg. Procurement of appropriate machineries such as baler and shredder, start up cost of any recycling scheme, etc)
Kiribati has been recognised, by several aid agencies, as in need of waste management assistance	Require constant public awareness on waste minimisation and management issues

OPPORTUNITIES	OBSTACLES
Considerable studies had been undertaken on feasibility of scrap metal recycling	Current waste collection scheme is poorly managed
	Lack of expertise in waste management
	Public unable to pay for services
	Lack of public "perception of waste"
	No financial incentive to sort waste at source and dumpsite
	Cost of shipping material to external recycling facilities
	Small volume of recyclable material volume

[modified from Table 4.2 Opportunities and Obstacles for Waste Minimisation in Tarawa, of Sinclair (2000), p38]

3.4 Waste Storage

Waste is hardly stored at any premises. All solid wastes are dumped without containers beside the road site-waiting for collection by the Council staff. Liquid wastes like chemicals and used oil could be stored temporarily in drums. Since there are no facilities for treatment of such wastes, most just sit in drums for years until drums rust. The liquid wastes eventually seep into the ground if nothing is done to avoid spillage.

3.5 Waste Collection

The present waste collection system which is operated by local Councils on South Tarawa, Tarawa Urban Council (TUC) and Betio Town Council (BTC), is uniform to all sections of the community (ie. residential, institutions, industrial and commercial premises). Tractors and trailers are used by these Councils to collect general waste that is piled up on the road side. Depending on the pace of work of operators, collection can be twice or more per week for the three main centres of Betio by BTC while Bairiki, Nanikai and Bikenibeu are serviced by TUC. Apart from those most urbanised villages, the rest of South Tarawa and Kiribati dispose wastes either at sea or compost for gardening, bury or burn.

The Council collection system is labour intensive, slow and inefficient. Infrequent collection can result in unsightly waste scattering widely as a result of wind and animal scavenging. Related health problems happen frequently, particularly at households that are close to these waste piles. Heavy trash that can not be lifted manually would be left uncollected.

Hospital waste is supposed to be incinerated but due to constant breakdown of incinerator, some waste has to be burned with kerosene.

3.6 Waste Disposal

Collected wastes are dumped by both Councils at about ten dump sites along the coast of South Tarawa, mostly on the lagoon sides of the atoll. At most of these sites, the rubbish is reached by seawater at high tides and so lots of rubbish gets swept into the sea but most eventually comes back to shore alongside the dumpsites. This causes further pollution of both coastal waters and beaches covered with trash.

Rubbish dumping is uncontrolled at sites authorised by Councils and also by private landowners that wish to reclaim their property along the coast with sea wall. The public would know a dumpsite whenever they see Council staff empty their trailers from waste.

The sites are accessible by tractors and trailers, through feeder roads that are unsealed. The feeder roads usually detour from the main and only tarsealed road on the island.

All dump sites lack gates or fences and do not have offices or amenities or site management. Site services like water, power and sewer are also not available. The sites are not manned with staff and supervisors, and thus recording of waste type and vehicles is not practised. There are no recycling facilities on site.

Coastline sites are all calcium carbonate in atoll environments, and are rarely a metre above mean sea level in many cases.

All types of waste collected from residential, institutions and commercial entities are dumped together, without sorting or recycling at the dumpsites. There is no covering of these sites creating unpleasant sights, possible human health risks associated with toxic material, glass, sharp objects, and breeding of disease vector insects.

However, at some sites burning is done to lessen the impact of odour and economise space, but increases air pollution from fumes of burnt items like plastics.

It is further noted that no stormwater management, leachate management, fire controls measures or other environmental or public health control measures are in place. An environmental monitoring program has been outlined but not yet implemented.

Currently, a few landfill sites and their management plans are being considered under the Sanitation, Public Health and Environment (SAPHE) loan project from ADB. There are few potentially suitable sites and all are along the shoreline.

Due to about 50 % of the solid waste stream being biodegradable on Tarawa, composting is considered an advisable strategy. Composting will not only minimise the import of fertilisers but will also improve the quality of the soil for gardening. Traditionally, I-Kiribati people use composting for gardening, but most of the population on South Tarawa living at the main urban centres, rarely compost biodegradable waste. This is due to concerns of damaging underground cables (compost is traditionally buried) for utilities and the resulting compensation claims from telecommunication and utility companies for damaging their wires and pipes running underground. Food scraps are hardly thrown away but kept as animal (domestic chickens and pigs) feed.

There are no handling and disposal procedures for special wastes.

At present, dumpsite fates are determined by Councils. A dumpsite is usually left as it is with hardly any rehabilitation process, allowing nature to take its toll. Sites with seawalls encompassing them are normally covered with reef mud and left for few years, before Council or landowners can regard it as reclaimed land. Reclamation of old dumpsites on the foreshore usually results, thus creating more space for residential and / or commercial ventures.

The acquisition of land by government for development purposes (eg a landfill) is possible but very difficult. Under Foreshore legislation, the government owns the foreshore (of all the islands) which extends as far back as to where the sea tides reach the land. Due to the extensive use of the ground water for drinking water supply, and land issues, dumpsites along the coastline are considered the most practical.

Under legislation, whoever reclaims land on the foreshore owns it, only if approved by the Minister of Home Affairs and Rural Development. Hence if the government or council reclaim land along the shoreline, that reclaimed property belongs to them.

3.7 MANAGEMENT OF SPECIAL WASTES

Medical wastes such as sharps and syringes are put in small containers or boxes along with dressings, clothes etc, all which need incineration. This waste is burned using kerosene at the hospital. The remaining wastes are disposed of at the dumpsites by Council staff.

Many of the urban areas are sewered with the effluent being discharged via outfalls that extend into the deep ocean. No details on septic sludges / septage was available.

There is a general lack of an appropriate collection system for waste oils generated from the powerhouse, garages and bowsers. Typically, used oil is stored in drums, particularly at the Kiribati Oil company (KOIL) and sometimes at the Powerhouse, awaiting shipment to be taken to Fiji or other oil recycling facilities in the Pacific region. This is done through the Fiji-based Mobil company. Problems with the collection system relate to the lack of empty drums and financial costs for handling charges.

Quarantine waste received from ships is burned by a firewood-powered incinerator. The incinerator is a donation from the South Pacific Commission (SPC). Airport facilities lack an incinerator so waste is burned with kerosene and firewood by the agricultural authority. A hole is simply dug and waste is manually burned.

SPC will be providing another three incinerators of the same brand that require firewood, one for the airport at the capital and the rest for the Kiritimati port and airport quarantine sites.

Scrap metal from derelict vehicles, mechanical equipment and World War II relics are causing problems of occupying limited land and aesthetic issues.

Used batteries are another environmental hazard. There is no current scheme for recycling or exporting to external facilities. Currently batteries are treated with other general waste and dumped at waste tips.

4. FUNDING OF WASTE MANAGEMENT

Councils receive funding for waste management through collection of fees including annual revenue for their waste collection services directly from Government. This revenue depends on the coverage of their services. For instance, BTC receives an annual fee of about $19,000 from Government bodies. The total annual revenue that includes all BTC customers is approximately $90,000. Generally, Councils receive approximately 25% of their total annual income (approximately $300,000) from waste collection services.

The following is the breakdown of charge fees (AUD) collected from customers by BTC and TUC annually:

- Government/Ministries Offices: $600

Private Business Offices: $400 ($300 at BTC)

Small Private Stores: $50

Residential households: $17.

Councils recover Government fees directly from the national treasury (Ministry of Finance and Economic Planning) on a quarterly basis. Civil servant's fees are deducted automatically from their salaries and then collected by Councils from MFEP as well. Service charges from private businesses and non civil servants are collected regularly by Council staff by calling at respective premises. This mechanism of fee collection by Council seems efficient because almost 100 % of the expected revenue are fully recovered.

However, the annual revenue obtained from waste collection services by Councils is often below the actual annual expenditure thus causing financial burdens to Councils. Expenditure is usually escalated by constant maintenance problems of the vehicles, other machinery used and paying due benefits (like dirt bonus, overtime, etc) to operators of the waste collection system. Councils would tend to use other budgetary allocations to meet this financial burden.

Government always provide Councils with annual grants as subsidy for routine expenditures. However, this grant is never adequate to allow Council to run waste collection services smoothly as there are more high priority areas beside waste management.

In some instances foreign development assistance has provided goods and services including machines and equipment for collection of waste. The Councils would then endeavour to undertake these services within their resources limitation.

Establishment and operation of a waste disposal site is generally costless because it is not a controlled and managed landfill but a dumpsite along the foreshore.

The annual Government subsidy in the form of grants to both Councils is a major source of funds. For large projects, like the establishment of a large waste tip, Councils have to seek external financial assistance through Government. Councils survive on a very small budget. Waste management is one of the lowest priorities within Councils and thus both mismanagement of available but limited resources and lack of formal planning including short term improvements usually result. Consequently procurement and maintenance of vehicles is delayed and staff are not trained in proper waste management.

Minimal environmental monitoring is currently undertaken but Government bears the major financial responsibility through its annual recurrent budget allocated to its relevant authorities such as health inspection and environmental protection.

5. RELEVANT GOVERNMENT AGENCIES

There are two levels of government in Kiribati with a National government covering all of the islands (33 islands) and local councils on the Capital and the outer island. There are also a couple of local councils on two islands in the Line Islands group but the rest have no local council.

Under the recent Environment Act 1999, Ministry of Environment and Social Development (MESD), through its Environment and Conservation Division (ECD), is responsible for establishing and enforcing legislation and regulations relevant to environmental protection and conservation, monitoring environmental guidelines and standards including undertaking environmental impact assessments of waste sites. Public awareness on these issues is another crucial component.

Under the Foreshore and Land Reclamation Act 1969 and the Land Planning Ordinance, the Ministry of Home Affairs and Rural Development, through the Lands Management Division, is responsible for granting approval to foreshore usage and reclamation as in case of siting waste disposal sites.

The Public Health Ordinance 1926 has provision for the Ministry of Health to advise Local Councils on siting of rubbish dumps in relation to distances from dwellings and threat of pollution to groundwater.

Waste management is under the auspices of the Ministry of Health and Family Planning (MHFP), Ministry of Environment and Social Development (MESD), the respective Councils, BTC and TUC, and Lands Management Division. The lead role has not been identified yet.

Contact details:

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MHFP	Nawerewere, TARAWA	28100	28152	
MHARD	Bairiki, TARAWA	21092	21133	
LMD	Bairiki, TARAWA	21283/21302	ditto	
BTC	Betio, TARAWA	26477	26278	
TUC	Teaoraereke, TARAWA	21294		

6. OTHER PEOPLE CONTACTED:

- Mr Taulehia Pulefou, Pollution Control Officer, Environment and Conservation Division, MESD

- Ms Buretau Kaureata, Clerk to the Betio Town Council (BTC), MHARD
- Mr Nakabuta Nakabuta, Quarantine Officer, Agricultural Division, Ministry of Natural Resources Development, (MNRD)

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Japan International Cooperation Agency

GUIDELINES FOR SOLID WASTE DISPOSAL SITE MANAGEMENT IN PACIFIC ISLAND COUNTRIES

COUNTRY REPORT ON URBAN SOLID WASTE MANAGEMENT

Rarotonga, Cook Islands

1. WASTE MANAGEMENT POLICY AND PLAN

No formal waste management policy or adopted plan was identified, although, an ADB study includes an infrastructure plan which covers solid and hazardous waste management.

Cook Islands National Environmental Management Strategy (1993)

2. RELEVANT LEGISLATION, REGULATIONS, AND GUIDELINES

Not reported.

3. CURRENT SOLID WASTE MANAGEMENT PRACTICES

3.1 Waste Generation

An ADB study that was undertaken in the Cook Islands indicated that the domestic waste generation rate was of the order of 0.2kg/person/day. Approximately 4.75 tons of waste is collected per day (40% residential, 60% commercial) with organics (32%) and glass (24%) comprising a significant portion of the stream.

3.2 Littering and Indiscriminate Dumping of Waste

Dumping of waste and littering is not common in Rarotonga. A number of education programs about littering and recycling have been undertaken.

3.3 Waste Minimisation Activities

A number of wastes are not accepted in the collection service including garden wastes, motor batteries, white goods and other large items. Householders themselves must transport these wastes to the waste facility. Activities such as the backyard burning of garden waste and other combustible materials are encouraged.

3.4 Waste Storage

Waste at domestic premises is typically stored and collected from 44-gallon drums. For commercial, industrial and institutional premises, waste storage is dependent on the collection method. One waste contractor typically uses 44 gallon drums while another one typically provides mini-skips and has the facilities (hydraulically operated lifting arm) to service these bins)

3.5 Waste Collection

Waste collection is undertaken by a contractor and funded by the Government. No charge is levied on households for this service. Collection frequency varies but occurs at least once per fortnight.

Private contractors, that charge on the number of bins collected, commonly service commercial, industrial and institutional premises. A number of these types of premises also undertake their own waste transportation service.

3.6 Waste Disposal

Rarotonga has one waste depot, which serves the whole island. The depot is located in the lower hills at Nikao (behind the airport). The site is privately owned although the Public Works department operates the site.

Access to the Nikao site is difficult during wet weather as the access road is not sealed (gravel/dirt) and this restricts services.

The dumpsite is manned at the entry by the landowner who also collects the entry fee. No details are available on site services (ie. Site gatehouse/ office or its amenities). The site is locked (by the site owner) restricting access outside of opening hours.

The most recently available report indicated that the site is considered to have a limited life (until end of 1998). However it is understood that while the ADB funding for a new landfill site has commenced, there is not yet a new operational site.

The Public Works department utilises an excavator to extract cover material for the waste site, and a bulldozer to move, cover and compact the waste. It is generally considered that the depot is well run with good covering of waste. It is however, noted that past operation of the depot has been poor with little covering of the waste occurring due to a lack of machine operation (no fuel to run bulldozer or excavator).

There is not believed to be a formal leachate management system at the site although a stormwater system exists which diverts stormwater into a nearby creek.

Wastes from all residential, commercial, industrial premises are disposed of at the Nikao dump although the following wastes are generally excluded:

- medical
- hazardous
- quarantine
- sludges/septic
- waste oil
- waste motor vehicle batteries
- garden wastes (generally on site disposal at domestic sites)

No details on recording of waste types, quantities, or vehicles are known to be collected.

Under the ADB study, recommendations have been made for improving the environmental management of the site. It is not known if this includes recommendation for the closure and rehabilitation of the site

The Rarotonga Recycling Centre undertakes recycling activities in the Cook Islands. Materials recycled include aluminium cans, glass bottles and PET plastic bottles. Some glass and plastic bottles are resold to the brewery and local soft drink/fruit juice bottler for reuse. Food scraps are typically fed to the family pigs, chickens and dogs.

A high degree of separation is reportedly undertaken by commerce and industry to minimise waste deposal costs (these are volume based). Recyclable materials are typically sent to the Rarotonga Recycling Centre.

Waste oil from Mobil oil customers is collected and transported to Fiji for use as a fuel. Disposal of waste oil from other users is not known.

The proposed landfill (ADB project) will have a number of measures to protect the environment including a subgrade drainage system, composite landfill liner, leachate collection system, landfill gas collection system and groundwater monitoring wells.

3.7 Management of Special Wastes

Medical / clinical wastes from the hospital are incinerated via a relatively new incinerator with the ash being disposed of to the landfill. Problems with operation (due to inexperienced personnel) have been noted

Sludges / septage are believed to be ploughed into the land for agricultural purposes

Waste oil from Mobil customers is collected and sent to Fiji for use as a fuel source. The disposal practices for other waste oil is not known

Quarantine waste is incinerated in one of two old incinerators (more than 20 years old) at the international airport. The incinerators are reportedly operated adequately by the Airport Authority. Shipping waste is not accepted at the port

4. FUNDING OF WASTE MANAGEMENT

Details on the funding of waste management are not clear although it is understood that a budget is allocated as part of the national government budgets. (Therefore revenue will be through such sources as taxes, levies etc.). Charges at the landfill site are as follows:

- Cars – NZ$5.00
- Utility Trucks – NZ$10.00
- Trucks / commercial loads – NZ$20.00

Estimates (UNEP, SPREP, 1997) have been made for various components of future waste management as follows:

- Rarotonga Collection Treatment and disposal - $2,959,440 ($US, 1995)
- Rarotonga Recycling Centre – $661, 848 ($US, 1995)
- Rarotonga Existing Site Remediation and Closure - $482,196 ($US, 1995)
- Aitutaki Landfill and Collection - $1,669,140 ($US, 1995)
- Technical Assistance for Project Implementation - $191,151 ($US, 1995)

5. RELEVANT GOVERNMENT AGENCIES

Waste collection and disposal is managed by the national government department (Ministry of Works, Environment and Physical Planning).

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