

Contents

| | |
|--|-----------|
| 1. Introduction | 1 |
| 2. Overview of Existing Solid Waste Management Practices, Methods and Regulations | 2 |
| 2.1 Introduction | 2 |
| 2.2 Bouffa Landfill and Port Vila Collection System | 2 |
| 2.3 Collection System | 3 |
| 2.4 Statistical Issues | 5 |
| 2.5 Existing Data on Waste Composition | 5 |
| 2.6 Education | 7 |
| 2.7 Littering and Illegal Dumping of Wastes | 7 |
| 2.8 Legislation | 8 |
| 2.9 Recycling Initiatives | 9 |
| 2.10 Other Initiatives | 10 |
| 3. Audit and Characterisation of the Solid Waste Stream | 11 |
| 3.1 Introduction | 11 |
| 3.2 Methodology | 11 |
| 3.3 Vehicle Survey | 12 |
| 3.4 Classification at the Landfill | 12 |
| 3.5 Vehicles to Weighbridge | 13 |
| 3.6 Results | 13 |
| 3.6.1 Vehicle Survey | 13 |
| 3.6.2 Results of Waste Classification at Landfill | 16 |
| 3.6.3 Results of Vehicles at Weighbridge | 19 |
| 3.6.4 Consultation | 22 |
| 4. Evaluation of Waste Management Systems and Markets for Recyclable Materials | 27 |
| 4.1 Evaluation of Waste Management Programmes | 28 |
| 4.1.1 Waste Reduction | 28 |
| 4.1.2 Collection and Transfer of Wastes | 29 |
| 4.1.3 Legislation/Regulation | 30 |
| 4.1.4 Recycling | 31 |
| 4.1.5 Incineration | 33 |
| 4.1.6 Sanitary Landfills | 33 |
| 4.1.7 Composting | 34 |
| 4.2 Opportunities and Obstacles | 36 |
| 4.3 Existing Markets | 37 |
| 4.4 Potential Markets | 38 |
| 4.4.1 Glass Recycling | 38 |
| 4.4.2 Paper Recycling | 38 |
| 4.4.3 Plastic Recycling | 39 |
| 4.4.4 Metal Recycling | 39 |

| | |
|--|------------------------------|
| 4.4.5 Composting | 39 |
| 4.4.6 Prices for Recyclables | 41 |
| 4.4.7 Issues for Recycling from Pacific Islands to Overseas Destinations | 41 |
| <hr/> | |
| 5. Alternative Integrated Solid Waste Management Activities | 43 |
| 5.1 Introduction | 43 |
| 5.2 Implementation | 43 |
| 5.3 Ranking of Alternatives | 45 |
| <hr/> | |
| 6. Rate Structure for Finance Waste Management Activities | 48 |
| 6.1 Cost Priorities for Waste Management Options | 48 |
| 6.2 Recommendations on Fee Collections | 48 |
| <hr/> | |
| 7. Integrated Solid Waste Management Plan | 50 |
| 7.1 Objectives of the Plan | 50 |
| 7.2 Waste Minimisation | 51 |
| 7.3 Refuse Collection | 52 |
| 7.4 Disposal of Refuse to the Landfill | 52 |
| 7.5 Special Wastes | 53 |
| 7.6 Community Involvement | 53 |
| 7.7 Organisation of Solid Waste Management | 54 |
| 7.8 Implementing the Plan | 55 |
| <hr/> | |
| Appendix A - | Terms of Reference 56 |
| <hr/> | |
| Appendix B - | Study Methodology 57 |
| <hr/> | |
| Appendix C - | Curricula Vitae 58 |
| <hr/> | |
| Appendix D - | List of Contacts 59 |
| <hr/> | |
| Appendix E - | References 62 |
| <hr/> | |
| Appendix F -Notes of Initial Project Meeting and Final Workshop | |
| <hr/> | |
| Appendix G - Excel Spreadsheet of Waste Classification Data | 67 |
| <hr/> | |
| Appendix H - Excel Spreadsheet of Vehicle Survey Data | 68 |
| <hr/> | |
| Appendix I - Notes of Meeting with Industry | 69 |
| <hr/> | |

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Acronyms and Abbreviations

| | |
|-------|--|
| SPREP | South Pacific Regional Environment Programme |
| WHO | World Health Organisation |
| MoH | Ministry of Health |
| DoH | Department of Health |
| PET | Polyethylene teraphthalate |
| HDPE | High density polyethylene |
| FSP | Foundation for the People of the South Pacific |

Executive Summary

Action Plan

| Waste Management Sector | Action | | | Responsibility | Timeframe |
|---------------------------------------|--|--|--|----------------|-----------|
| | Priority 1 | Priority 2 | Priority 3 | | |
| Implementing the Plan | <ul style="list-style-type: none"> Workshop with Council, government ministers, NGOs, business and community leaders, Environment Unit and DoH. Prioritisation of actions and responsibilities | <ul style="list-style-type: none"> Form a Solid Waste Committee Appoint and train a Solid Waste Officer Set targets for waste reduction | <ul style="list-style-type: none"> Obtain funding for demonstration recycling schemes Review national funding of waste management Identify responsibilities for littering enforcement | | |
| Waste Minimisation Initiatives | <ul style="list-style-type: none"> Investigate segregated municipal waste collections | <ul style="list-style-type: none"> Negotiate cheap shipping of waste materials for recycling overseas | <ul style="list-style-type: none"> Investigate possibility of national waste management fund | | |
| Metal wastes | <ul style="list-style-type: none"> Increase quantity of metals recycled through increased publicity for existing scheme | | <ul style="list-style-type: none"> Government to investigate project to implement crushing of large waste steel items | | |
| Biodegradable Waste | <ul style="list-style-type: none"> Designate area at landfill for green and organic waste Implement shredding and composting of green and organic waste | <ul style="list-style-type: none"> Set up agreement and scheme with Rainbow Gardens to compost organic waste from market | | | |
| Plastic waste | <ul style="list-style-type: none"> Separate PET and HDPE collection | <ul style="list-style-type: none"> Implement shipping plastics to Australia for recycling | <ul style="list-style-type: none"> Implementation of packaging legislation | | |
| Paper waste | <ul style="list-style-type: none"> Separate paper collection | | <ul style="list-style-type: none"> Investigate purchasing paper shredder and baler for shipping paper to Australia | | |
| Glass waste | | | <ul style="list-style-type: none"> Negotiate with brewery to collect waste glass | | |
| Other waste | | | <ul style="list-style-type: none"> Investigate a hotel/resort pilot project | | |
| | | | | | |

| | | | | | |
|---------------------------------|---|--|--|--|--|
| Refuse Collection System | <ul style="list-style-type: none"> • Prepare a plan for segregated municipal waste collection of all recyclables • Implement improved accounting system for waste mgt. income and expenditure | <ul style="list-style-type: none"> • Purchase more wheelie bins for domestic collection | <ul style="list-style-type: none"> • Obtain funding for fitting the trucks with hydraulic lifting gear | | |
| Landfill | <ul style="list-style-type: none"> • Management plan for Bouffa Landfill • Put in place systems to stop dumping oily and hazardous wastes in leachate ponds | <ul style="list-style-type: none"> • Regular management meetings for landfill operation • Establish funding for operating leachate ponds | <ul style="list-style-type: none"> • Annual review of tipping and collection fees • Plan to monitor boreholes • Implement monitoring of wells at Fres Wota Dump | | |
| Special Wastes | <ul style="list-style-type: none"> • Initiate waste oil collection system with Mobil/Shell | <ul style="list-style-type: none"> • Develop hazardous waste classification and management system | <ul style="list-style-type: none"> • Strengthen hospital waste segregation and disposal • Implement waste pesticide and chemical container collection • Implement waste battery collection system | | |
| Community Involvement | <ul style="list-style-type: none"> • Education programme for schools, businesses, community groups | <ul style="list-style-type: none"> • School collection schemes for recyclables • Publicity campaign on new recycling schemes and segregated waste collection | <ul style="list-style-type: none"> • Investigate curriculum changes • Education programme for hotels and tourism operators | | |

1. Introduction

This report was financed by the European Communities from a grant of the European Development Fund and is presented by the consultant Sinclair Knight Merz Ltd for consideration of the Vanuatu Government. It does not necessarily reflect either the opinion of the latter or the European Commission.

Sinclair Knight Merz was commissioned by the South Pacific Regional Environment Programme (SPREP) to carry out the Solid Waste Characterisation and Management Plans Project in 8 Pacific Countries including Fiji, Tonga, Vanuatu, Papua New Guinea, Kiribati, Tuvalu, Solomon Islands and Samoa.

This is the final report for Port Vila, based on the findings of the fieldwork carried out by the author in Port Vila from 22nd September – 6th October 1999. The aim of the report is to present the results of the waste characterisation work carried out while in Vanuatu and to describe the current waste management practices in Port Vila. The report also aims to formulate options and priorities for an integrated solid waste management plan for Port Vila. The terms of reference for this project are given in Appendix A.

2. Overview of Existing Solid Waste Management Practices, Methods and Regulations

2.1 Introduction

Port Vila is Vanuatu's capital city on the island of Efate, with a population of approximately 38,000.

The Port Vila Municipal Council provides solid waste collection and disposal facilities within the town.

This section describes the current solid waste management practices in Port Vila, from waste generation to waste collection systems, disposal, the landfill, littering, legislation and education and awareness.

2.2 Bouffa Landfill and Port Vila Collection System

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. The Bouffa Landfill replaced the previous rubbish dump that was located at Fres Wata North, about 1 kilometer from the centre of town.

The Bouffa Landfill is located in a valley, approximately 15 hectares in size, about 8.5 kilometers from town. The site was selected and designed using input from experts funded by the World Bank, WHO, UNDP and ESCAP. The landfill was designed with a capacity of 525,000m³ and a life of 15-20 years. The filling method is trench operation – the first trench is still being used at present, but the second trench should have been started at least two years ago. 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 for hazardous waste disposal and not leachate and stormwater treatment. 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 with soil. There is uncontrolled burning of waste at the face of the landfill at times and this is dangerous –

fires should be put out properly. Flies and the smell did not appear to be a significant problem. There is a gate at the main access way with a gate-keeper 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.

Septic tank sludge from homes and commercial properties in Port Vila is discharged at the landfill by the septic tanker operators. It is also likely that some waste oil is being 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. The hospital should use a skip to collect general waste for disposal to the landfill.

There are three closed dumping areas in Port Vila

2.3 Collection System

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 garbage collection fees given below in Table 2.1 were introduced in July 1998.

Table 2.1 Garbage Collection Fees

| 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 |

| | |
|------------|-------|
| Dislatcher | 1,500 |
|------------|-------|

The budget for waste management in Port Vila was not easily accessible and it may be because the accounting system does not readily have waste management budgets and incomes available. Sections in the 1996-97 financial budget include funds for salaries, equipment maintenance, fuel, new equipment eg bins and projects, but it is not known how much of these funds are used on waste management specifically. According to the Council staff, solid waste management services in Port Vila have not been subsidised by the Government since 1992.

Household rubbish is collected three times per week on Monday, Wednesday and Friday, or Tuesday, Thursday and Saturday. Commercial, Restaurants and Hotel waste is collected three - four times per week on Tuesday, Thursday, Saturday and Sunday. Domestic waste is generally placed on the kerbside in drums, metal or plastic rubbish bins, plastic bags or baskets. The Council purchased 400 x 240 litre wheelie bins recently and these have been distributed around the town, mostly to commercial premises, although the policy on who gets them is unclear. Approximately 30,000 Vatu was spent on the purchase of wheelie-bins.

There are 5 waste collection trucks of 3 different sizes - 1 x 11 m³, 2 x 10 m³ and 2 x 7 m³. None of the trucks have hydraulic lifting gear. There are 10 x 7m³ skips and 6 x 10 m³ skips for hire. There are 10 small skips (4 m³) and 6 large skips (7.5m³) and one roller bin truck for handling the bins.

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

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.

2.4 Statistical Issues

The population of Port Vila has been growing rapidly over the last 20 years - from 10,600 in 1979 to 38,100 in 1999 (average of 13%

per annum). Solid waste management is largely a population related issue and in rapidly expanding urban areas it can become one of the major environmental concerns with the associated potential for adverse health and social effects. The establishment of the new sanitary landfill at Bouffa in Port Vila has alleviated any immediate major concerns with where to dispose of waste, but the issues of collection of waste from an expanding population, collection equipment, littering and enforcement, and the life of the landfill have not been addressed yet. Waste minimisation is an essential element in managing the solid waste of a growing urban population into the future and this has not yet been implemented.

The imports to and exports from a country can have an effect on waste generation. The gross domestic product (GDP) of Vanuatu at producers prices is 26,633 Vatu in 1995, comprising of:

| | |
|-------------------------------------|-------------|
| Agriculture, Fisheries and Forestry | 6,053 Vatu |
| Industry | 3,569 Vatu |
| Services | 17,011 Vatu |

Exports for the first quarter of 1999 were valued at 1,112 Vatu and Imports were 2,432 Vatu.

Australia has the highest level of imports into Vanuatu at 40% of the total and New Zealand is second at 10% of the total. Australia is third in level of exports it receives from Vanuatu at <10% and New Zealand is seventh at <1%. The countries that are importing goods into Vanuatu like Australia and New Zealand are exporting 4 times as much into the country as they buying back, and should therefore be willing to consider taking more responsibility for the waste materials that are generated as a result of their imports to Vanuatu.

2.5 Existing Data on Waste Composition

A limited waste survey was undertaken in Port Vila in 1990 and the results showed the composition given in Table 2.2. The results are based on a visual assessment.

Table 2.2 Composition of Solid Waste in Port Vila 1990

| 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 |

Reference: Truebridge, Calender, Beech. "Waste Management of Port Vila – Relocation of the Waste Tip".

Previous solid waste generation factors have been reported for Port Vila and these can be used as a rough comparison for the figures produced in this study.

Table 2.3 Solid Waste Generation Factors

| Waste Component | Factor (kg/person/year) | Original Source | Equivalent daily generation (kg/person/day) |
|-------------------------|--------------------------------|-------------------------------------|--|
| Total Waste | 219 | Dr. H Ogawa | 0.6 |
| Household waste | 183 | Lyonnais des Eaux-Dumez, SITA, 1992 | 0.5 |
| Green waste | 329 | | 0.9 |
| Household + Green waste | 512 | | 1.4 |
| Hospital Waste | 475 | | 1.3 |

Reference: ADB Report, "Sanitation Masterplan for Port Vila", 1998.

2.6 Education

At present there is very little education of the public on waste management carried out in Vanuatu. There has been one play performed by the Wansmolbag Theatre Group on littering and the adverse effects of waste on the environment. Whether this play has had any effect on the actions of the public is difficult to ascertain. A multi media campaign on raising the level of public awareness of waste management issues is essential for Port Vila.

There is no education on waste management included in the curriculum at present. Education at primary, secondary and tertiary levels on waste management should be considered.

2.7 Littering and Illegal Dumping of Wastes

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.

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

2.8 Legislation

At present the Environment Unit is part of the Department of Lands and Natural Resources. While solid waste management is within the realm of the Environment Unit, they are under-resourced and do not consider that they have a mandate to act other than in an advisory role at present.

There are a number of pieces of national legislation and local by-laws in Port Vila that have implications for solid waste management. At a national level there is:

- 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

The new Environmental Legislation is currently being drafted and at present is open for public comment. The legislation is not likely to be passed until the end of 2000. It will rely of a National Waste Management Committee for decisions of solid waste management. The committee will have three years to initiate the formulation of a comprehensive integrated National Waste Management Policy and Implementation Plan. It is apparent that this legislation will take some time to have an effect on solid waste management and there are issues of conflict in the proposed committee being responsible for both the setting of policy and the implementation. It is not clear who the members of the committee will be, but they will not be responsible for operation of the plan. There will undoubtedly be conflicts and difficulties if the “regulator” (the new Department of Environment and Conservation) tells the “operator” (Port Vila Municipality) how to comply.

A draft Waste Management Act for the Republic of Vanuatu was 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
 - Litter By-law, 1997

All of these by-laws deal with the prevention of littering or dumping of wastes in public areas or unoccupied land, and provisions 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.

2.9 Recycling Initiatives

There is a beer bottle recycling scheme at the Vanuatu Brewery which operates successfully, probably because they pay a 10 vatu refund for each bottle returned. About 92-94% of bottles are returned.

Scrap metal recycling is carried out by a private individual for most non-ferrous metals, including copper, aluminium, brass, zinc, lead, stainless steel. The facility operates under the registered name of Vanuatu Recyclers and is a back-yard operation. Metals are collected either by school children, from hotels or from the landfill and are crushed or stripped and packed in to a container for shipping to Tools and Ingots in Brisbane, Australia. About 2 containers or 32 tonnes of metal is shipped per year. Concern was expressed by the owner that many hotels and clubs do not participate in the segregation and collection of cans. There is no ferrous metals collection at present in Vanuatu.

Waste oil recycling is available through Mobil shipping the waste oil to Fiji for burning in furnaces. However at present this is only carried out in a partnership arrangement with Unelco's waste oil.

Rainbow Gardens has been operating the Municipal owned mulcher/grinder on a trial basis to make compost for use in the gardens from the green waste that was produced as a consequence of Cyclone Dani. The machine has had some problems initially and does not perform well with wet banana stems or large amounts of green leaves. Port Vila Municipal Council is keen to implement a composting scheme and has been discussing a more permanent arrangement with Rainbow Gardens to continue to use the green waste mulcher/grinder and to deliver the market waste to Rainbow Gardens to make compost.

There is no PET recycling in Vanuatu.

There is no paper and cardboard recycling carried out in Vanuatu at present.

2.10 Other Initiatives

There are currently two other projects running in Vanuatu on solid waste management. FSP in partnership with the Environment Unit and funding from SPREP is currently working on a project on waste minimisation. The main objectives of the project are to gauge the level of awareness, identify perceived solutions, increase knowledge about prevention, minimisation, reuse and recycling, to provide recommendation for a National Waste Management Policy and to provide a high level forum for discussion for priorities and an action plan. An advisory committee will be formed including the Environment Unit, the Municipal Council, Department of Provincial Affairs, Chamber of Commerce, Department of Health and FSP.

The second project is being implemented by the Port Vila Municipality and aims to conduct activities to raise awareness of solid waste management issues in Port Vila.

3. Audit and Characterisation of the Solid Waste Stream

3.1 Introduction

In Port Vila one of the factors that contributes to the poor management of solid waste is the lack of consistent data on the composition and quantity of solid waste being produced. The data will be necessary for the management of the current landfill. It is also necessary for the setting of targets for waste reduction, reuse, recycling and will allow the measurement of success of any waste minimisation initiatives that are implemented.

An initiation meeting was held at the Environment Unit on 22nd September 1999 to discuss the objectives of the project and the activities to be carried out during the fieldwork. The attendees were as follows:

1. Juliet Woodward Sinclair Knight Merz
2. Andrew Reeve Sinclair Knight Merz
3. Dr Suresh Raj SPREP
4. Ernest Bani Environment Unit
5. Albert Williams Port Vila Municipal Council
6. Karen Preston Federation for the Peoples of the South Pacific
7. Michael Vari FSP
8. Elison Bovu FSP
9. Virian Tovu Department of Health
10. Jo Dorras Wansmolbag Theatre Group

The minutes of the meeting are given in Appendix F.

3.2 Methodology

The following activities were programmed during the 3 weeks of fieldwork in Vanuatu:

- Survey of all vehicles using the Port Vila Landfill over a 7 day period to determine vehicle numbers, waste types and quantities
- Waste classification at the Port Vila Landfill
- Waste vehicles to weighbridge
- Waste Audits on selected businesses
- Interviews with people involved in waste management

The fieldwork was followed up with a workshop for stakeholders, to present the results of the investigations and to determine options and priorities for a solid waste management plan for Port Vila.

The methodology for the first three activities is given in Section 3.2 – 3.5 below and the results are given in Section 3.6. The notes from the industry waste audits and interview are given in Appendix I.

3.3 Vehicle Survey

In order to calculate total volumes and types of refuse reaching the landfill, a record of all types of vehicles and their volume and type of refuse was recorded over a one week period. The survey of vehicles entering the Bouffa Landfill was carried out each day (except Sunday) over a 7-day period from the 24th September – 11^h October. The hours covered were approximately 8.30am – 5pm (Note: these are the hours the landfill is open). The survey recorded the following data:

1. Time of arrival
2. Vehicle type based on the categories – waste collection truck, municipal skips, large truck, medium truck, small truck, van/station wagon or car.
3. Waste type – domestic, industrial or commercial
4. How full was the vehicle – 25%, 50%, 75% or 100%
5. Visual analysis of waste based on volumes of the following categories – paper, plastic, glass, metal, organic, textile, hazardous, construction and other.

3.4 Classification at the Landfill

Waste analysis was carried out on a mixed sample of waste from the municipal waste truck on four consecutive days (27th – 30th September). A sample size of approximately 1-2 m³ was unloaded from the municipal waste truck at a clear area for sorting, and the remaining waste was dumped into the landfill area. Sorting into the 9 primary categories, and some selected secondary categories of waste was carried out on a large plastic sheet and each category was weighed using a mechanical hanging scale. The scales read up to 100 kg in 0.5kg intervals. Weighing was carried out using a 55 litre plastic rubbish bin and the scales were zeroed for the weight of the empty bin. Once weighed, the waste was moved back to the tipping face by the bulldozer.

The density of the mixed waste was also checked by weighing the full 55 litre bin 7 times and averaging the results.

3.5 Vehicles to Weighbridge

The weighbridge at the wharf was identified as suitable for weighing selected vehicles in and out of the Bouffa Landfill. The large and small Council waste trucks were weighed three times each when full. The vehicles were also weighed when empty and the total weight of waste carried in each load was calculated. A count of the number of residential and commercial properties collected from by the Council trucks for each of the loads that were weighed. This allowed an average weight factor for the vehicles weighed to be calculated and an average weight of waste generated per household and per person to be calculated.

Typical waste weight factors for smaller vehicles have been taken from work previously carried out by Egis Consulting (Australia).

The total weight of waste going to the landfill was calculated using the vehicle numbers and types and multiplying by the waste weight factors for each vehicle type.

3.6 Results

3.6.1 Vehicle Survey

There are three sections (a, b, c) of information that have been drawn from the information recorded during the 7 days of vehicle survey at the landfill. The results of the Vehicle Survey visual analysis are given in Appendix H.

(a) A summary of results on vehicle types is given in Table 3.1.

Table 3.1: Numbers and Type of Vehicles

| | Total Number in Week | Percentage% |
|--------------------------------|-----------------------------|--------------------|
| Type of Vehicle | | |
| Council Truck 11m ³ | 34 | 21 |
| Council Truck 10m ³ | 11 | 7 |
| Council Truck 7m ³ | 15 | 9 |
| Large Truck | 12 | 7 |
| Medium Truck | 14 | 9 |
| Small Truck | 10 | 6 |
| Van/Utility/Trailer | 48 | 48 |
| Car/Station wagon | 1 | 1 |
| Other (Skip) | 17 | 10 |
| Total | 162 | 100 |

| General Waste Type | | |
|---------------------------|------------|------------|
| Domestic | 66 | 41 |
| Industrial | 16 | 10 |
| Commercial | 80 | 40 |
| Total | 162 | 100 |

(b) Total Quantity of Waste Delivered to Landfill

The total quantity of waste delivered to the landfill during the week of the survey can be estimated using the total number and type of vehicles and the waste factors obtained from the weighbridge results and from the Egis Consulting data.

The waste factor for the Council waste trucks was checked using the data gathered at the weighbridge and an average waste factor of 2.09 tonnes for the large Council truck, 1.9 tonnes for the medium Council truck and 1.4 tonnes for the small Council truck was obtained. A factor for the average percentage fullness of the vehicle has been used and this was calculated using a weighted average based on the records taken during the vehicle survey (100% full for Council vehicles and 81% full for other vehicles).

Table 3.2 Total Waste Quantities (Domestic and Commercial) Per Week

| Type of Vehicle | Total Number in Week | Waste factor - domestic (tonnes) | Average % full | Total weight of waste (tonnes/week) | Wt % |
|------------------------------------|----------------------|----------------------------------|----------------|-------------------------------------|------|
| Council Truck (11m ³) | 34 | 2.09 | 100 | 71.06 | 41.3 |
| Council Truck (10 m ³) | 11 | 1.9 | 100 | 20.9 | 12.1 |
| Council Truck (7m ³) | 15 | 1.4 | 100 | 21 | 12.2 |
| Large Truck | 12 | 1.16 | 81 | 11.27 | 6.6 |
| Medium Truck | 14 | 0.62 | 81 | 7.03 | 4.1 |
| Small Truck | 10 | 0.30 | 81 | 2.43 | 1.4 |
| Van/Station wagon | 48 | 0.30 | 81 | 11.66 | 6.8 |
| Car | 7 | 0.06 | 81 | 0.34 | 0.2 |
| Other (Skip - 10m ³) | 6 | 1.92 | 100 | 11.52 | 6.7 |
| 7m ³ | 11 | 1.34 | 100 | 14.74 | 8.6 |
| Total Weight/week (tonnes) | | | | 171.95 | 100 |

If the total population using the landfill for waste disposal is 38,000, then the average waste generation rate per capita is:

$$\text{Total waste per week (tonnes/week)} \div 7 \text{ (days)} \div 38,000 \text{ (persons)} = 0.65 \text{ kg/person/day.}$$

Any waste that is disposed of through illegal dumping, or through burning in back yards or at industrial properties is not accounted for in the figure above.

c) Visual Analysis During Vehicle Survey

Each vehicle that entered the landfill during the vehicle survey was observed while unloading and an assessment of the proportion (by volume) of each of the major waste streams was carried out. The

data was then entered into a spreadsheet and the average composition of all waste, domestic waste only and commercial and industrial waste was calculated. The results are given in Table 3.3 below. The results of waste classification (Table 3.4 below) from the sorting and weighing carried out at the landfill (described in Section 3.4 above) are more accurate and the visual analysis results below should be used as a comparison only.

Table 3.3 Visual Analysis of Waste Classification

| Waste Type | All Waste - Domestic Commercial & Industrial (Average %v/v) | Domestic Only (Average %v/v) | Commercial/Industrial Only (Average %v/v) |
|----------------|---|------------------------------|---|
| Mixed Domestic | 17.9 | 35.9 | 9.9 |
| Paper | 21.5 | 9.2 | 26.7 |
| Plastics | 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 |

The notable points from the data above based on visual observation (not weight) are:

- Combined waste is high in paper and organics
- Commercial waste is over one quarter paper
- Domestic waste is over half organics
- There are still low levels of metals reaching the landfill
- There is very little hazardous material reaching the landfill

3.6.2 Results of Waste Classification at Landfill

Table 3.4 gives the typical average composition of the waste collected in the government collection system based on the waste classification carried out at the landfill on 27th – 30th September 1999. The results of the weighing and sorting on each day were entered into a spreadsheet and the average results were calculated. The spreadsheet with complete data is given in Appendix G. A total of 1,310kg of waste was sorted and weighed over the four days. The density ranged from 145 – 170 kg/m³.

This data provides an indication of the waste composition but is based on a short period of time (4 days only) so will not allow for weekly or seasonal variations. The analysis should be repeated in the future at regular intervals to give more accuracy to the data and to allow trends to be identified.

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 | Polyethylene terephthalate (PET) | 0.3 |
| | Rigid High Density Polyethylene (HDPE) | 0.4 |
| | Flexible HDPE and 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 and Demolition | All | 0.7 |
| Other | Including rubber and other | 0.0 |
| Total | | 100% |

Summary Points

- Biodegradable material is very high at 71%wt.
- Paper wastes very high at 11.4%wt
- Plastics high at over 7%wt
- Very few returnable bottles were noted reaching landfill - this recycling scheme is working
- There is still 3.6%wt metals reaching the landfill
- Aluminium cans reaching the landfill are approximately 60 tonnes per year
- There is very little construction waste reaching the landfill as it is used by villagers for village purposes
- Over 80%wt waste going to landfill could be recycled or composted.

3.6.3 Results of Vehicles at Weighbridge

Two of the Council waste trucks (11m³ and 7m³) were weighed with a full load of domestic waste 3 times each. The number of households or commercial premises collected in each truckload was recorded and a generation rate per person was calculated. The results are given in Table 3.5 below:

Table 3.5 Results of Vehicle Weights

| Truck type | Number of houses collected | Average number people/house | Total number people | Number Commercial properties collected | Weight of vehicle before unloading | Weight of vehicle after unloading | Weight of Waste | Generation Rate |
|--------------------------|----------------------------|-----------------------------|---------------------|--|------------------------------------|-----------------------------------|-----------------|-----------------|
| | | | | | kg | Kg | kg | kg/person/ |
| Council 11m ³ | 78 | 4.9 | 382.2 | 25 | 7060 | 4970 | 2090 | 0.55 |
| Council 11m ³ | 70 | 4.9 | 343 | 5 | 6000 | 4970 | 1030 | 1.20 |
| Council 11m ³ | 162 | 4.9 | 793.8 | 0 | 6690 | 4940 | 1750 | 0.95 |
| Council 7m ³ | 222 | 4.9 | 1088 | 10 | 5180 | 3780 | 1400 | 0.53 |
| Council 7m ³ | 259 | 4.9 | 1269 | 4 | 5750 | 3780 | 1970 | 0.66 |
| Council 7m ³ | 54 | 4.9 | 265 | 0 | 4120 | 3780 | 340 | 0.56 |
| | | | | | | | Average | 0.74 |

Assumptions: There are 3 domestic collections per week and 3 commercial collections per week.
Average number of persons per household is assumed to be 4.9 in Port Vila, as given by the Department of Statistics.
Commercial properties are counted as equivalent to one household.

The generation rate of 0.74 kg/person/day calculated from the results of the vehicle loads and the household count, is slightly higher than the figure calculated using the total weight of waste to landfill and the total population using the landfill in Section 3.3.1 above of 0.65 kg/person/day. It represents a margin of uncertainty of approximately 12% which is considered acceptable. The weighbridge results are based only on 6 vehicle loads over 3 days where as the figure of 0.65 kg/person/day is based on a full week of records of vehicles and waste quantities. Therefore for the purposes of this report we will use the waste generation rate of 0.65 kg/person/day.

The density of waste ranged from 49 – 281 kg/m³ and the average was 162 kg/m³.

3.6.4 Consultation

3.6.4.1 People Consulted

Interviews were conducted with a range of industries and commercial operations in Port Vila as well as all of the businesses involved in waste management and recycling. The purpose of the interviews was to identify what types of waste are produced and what the current waste management practices are in industries, businesses and the Council, and to gauge the levels of awareness of waste minimisation concepts. The following organisations were interviewed:

1. Port Vila Municipal Council
2. Foundation for the Peoples of the South Pacific
3. Department of Conservation – Environment Unit
4. Centrepoin Supermarket
5. Pacific Chemicals Ltd
6. Asian Paints Ltd
7. BHP Ltd
8. Cello Vila Ltd
9. Le Lagon Parkroyal Hotel
10. Ken Hutton – Vanuatu Recyclers
11. Chamber of Commerce
12. Vanuatu Brewery
13. Vanuatu Beverage Ltd
14. Unelco Ltd
15. Mobil Oil Ltd
16. Rainbow Gardens
17. Port Vila Hospital

All of the interviews are written up and given in Appendix I. A summary of the important points is given below:

- There is very little segregation of waste at present
- There is a lack of knowledge of recycling and waste minimisation.
- There is very little environmental practice occurring but a low level of awareness of the environmental issues is there.
- There is a willingness to be involved in community schemes if they are initiated.
- No PET recycling in Vanuatu.
- Limited aluminium can recycling by a private business (about 40%wt of the market).
- Supermarkets are interested in reducing packaging waste and recycling but only if it is economic for them to do so.
- Some plastic chemical containers are recycled – this could be increased through education.
- Plastic bags are produced in Vanuatu and imported. There is no recycling or reuse of plastic bags.
- Some organic waste from hotels is sent to pig farmers
- Approximately 540,000 PET and HDPE bottles are imported per year by the largest beverage producer.
- Tourism is an important industry sector to target for waste minimisation and education
- Beer bottles are reused over 10 times. Bottle recycling works well.
- Waste oil recycling is carried out by Mobil for oil that is not contaminated.
- There is an excellent opportunity to implement composting of organic waste by working with Rainbow Gardens.
- The Hospital should implement a yellow bag system for medical waste to prevent to going to the landfill.

3.6.4.2 Workshop Issues and Concerns

The workshop to present the findings of the fieldwork was held at the Port Vila Town Council meeting room on 6/10/99. All of the waste management stakeholders were invited and all industries and businesses that had been interviewed. The discussion is summarised below:

1. Welcome, Opening of the meeting and endorsement of the project by the Mayor of Port Vila.
2. Introduction by Ernest Bani. – talked about all three projects, stakeholders from all sectors, integration and legislation.

-
3. Introduction by Albert Williams
 4. Presentation by Juliet Woodward.
 5. The comment was made that people in Vanuatu cannot afford to pay a lot for waste management
 6. There is lots of green waste here - it gets piled up on the streets.
 7. Who should pay for waste collection if a property is rented and there is a landlord? Often a landlord will bill the tenants for waste collection. These issues need to be sorted out.
 8. Export of waste materials is very dependent on the size of the market and economies of scale. Recycling would only work if it was economically viable.
 9. Importation of recycling machinery needs to be assisted eg. Duty or VAT free.
 10. At the Bouffa Landfill the second trench should have been started to be used 2 years ago and at present they are still using the first trench area ie. the landfill is not being managed as originally intended.
 11. There could be a levy on unsegregated wastes from houses.
 12. Paper wastes could be added to compost schemes at home.
 13. Glass could be used as an aggregate supplement - has been trialed in some countries. There are no suitable naturally occurring aggregates in Vanuatu - at present it is all imported.
 14. There is the Public Health Act at present with small sections on waste management - there is not enough teeth or support in the legislation and regulations for waste management. Draft waste management legislation has been prepared with assistance from the World Bank.
 15. No money has been received from the Government for waste management for the Municipality since 1983. The Ministry for Internal Affairs is responsible for the funding of government departments. The new waste collection trucks were from the World Bank and Japanese funding.
 16. The large wheelie bins are no good unless there is hydraulic lifting on the trucks. They are too heavy for lifting and collection time is too long.
 17. At present you can make a proposal to the government for funding for special projects.
 18. The burning of hospital waste at the landfill is no good at present - this is a very high priority.
 19. Sawdust should not go to the landfill.
 20. New Zealand funded the original incinerators to the quarantine area.
 21. The Kiwanis used to get containers for a nominal fee from Claus Bjornrem of South Seas Shipping.
 22. At the settlements the awareness is the most important issue.

23. Would like to see the report go to the Council of Ministers, and the Minister of Internal Affairs.

4. Evaluation of Waste Management Systems and Markets for Recyclable Materials

This section of the report reviews existing integrated waste management programmes and resource recovery systems and evaluates them for their applicability to conditions in the Vanuatu. Access to markets for recyclables is assessed and the cost of utilising these markets is discussed.

The feasibility of establishing recycling markets within the country is examined with respect to scrap metals, glass, paper, plastics and compost.

Factors to be considered in strategic waste management planning is summarised in Table 4.1, taken from the World Health Organisation Publication titled “Healthy Cities – Healthy Islands”, Document Series, No 6 December 1996.

This table is prepared to help decision-makers at national and local government level make strategic decisions for the improvement of their solid waste management services. The table shows issues that should be considered when prioritising waste management strategy actions.

Table 4.1 Strategic Issues for Solid Waste Management in Port Vila

| Requiring Special Attention | Special Characteristic of Solid Waste Management | Strategic Measures to Improve Solid Waste Management |
|--|--|---|
| Small country size | Excessive amounts of packaging - recycling is difficult due to lack of economies of scale and remoteness from recycling markets | Firm commitment of the relevant Authorities for better solid waste management - credibility of waste management authorities is vital |
| Economy of country – small economy – dependence on foreign aid | Difficulty in equipment maintenance - problems getting spare parts - lack of skilled mechanics | Strategic planning - waste management planning is essential to achieve cost-effective use of limited resources |
| Improvement of environmental health - through better solid waste management | Difficulty in site acquisition for landfill - lack of land - land ownership issues | Waste minimisation first - source reduction is the most important rule for solid waste management in the future |
| Protection of fragile environment | Insufficient or not duly trained human resources for | Improvement of collection service and cost saving |

| | | |
|--|--|--|
| <ul style="list-style-type: none"> - groundwater - coral and mangrove ecosystems are resource base for fisheries and tourism | waste management | <ul style="list-style-type: none"> - collection is the most expensive process in solid waste management; improvement and cost savings can generate financial resources for sanitary landfilling |
| Promotion of tourism - clean town and beaches will attract more tourists | Lack of cleanliness awareness among the public - urban dwellers not familiar with disciplines of urban living such as refraining from littering | Use of saved cost for final disposal improvement - careful siting and management are key to successful landfill |

It is recommended that the people involved in solid waste management in Port Vila Town Council and the Department of Environment and Conservation use the World Health Organisation document “Healthy Cities – Healthy Islands” Document Series, No 6 December 1996, as a reference for strategic planning of waste management in Port Vila. This document contains specific recommendations and criteria for the collection service, vehicles, waste receptacles, composting, recycling, transfer stations, management of contractors, landfill site selection, controlled landfill requirements, operation of landfill, as well as management and organisation of solid waste.

4.1 Evaluation of Waste Management Programmes

4.1.1 Waste Reduction

Waste reduction activities are important to halt or slow down the increasing rate of waste generation per capita. Waste reduction has several aspects, all of which should be addressed. These include toxicity reduction and volume reduction as well as encouraging products that can be recycled more easily. There are many successful cases of reduction of wastes by individuals, commercial enterprises and agencies using their purchasing power, as well as governments and industries.

In Pacific Islands countries, almost all goods are imported to sustain people’s daily needs. This generates an excessive amount of packaging waste which, because of the limited market, has very little possibility of recycling except for aluminium cans and beverage bottles. Waste minimisation measures such as recycling of package waste practicable in other parts of the world are not easily applicable in Pacific Island countries.

Waste reduction is therefore one of the most critical elements of a solid waste management strategy for Port Vila and is a practical option for a Pacific Island country. There **must** be a major focus on waste reduction in Port Vila in the future.

Recommendations

1. Prepare an action plan identifying how to reduce the amount of waste produced in Port Vila, including education, media campaigns, legislation, home composting.
2. Set targets for waste reduction for various waste streams and monitor them at regular intervals.

4.1.2 Collection and Transfer of Wastes

The waste collection system in Port Vila is generally successful in terms of providing for the efficient removal of waste from source to point of disposal. However the system may not be run in the most economically efficient way. The domestic collection system has not been privatised in Port Vila so benefits of privatisation have not been achieved.

The collection system is an integral part of the waste management strategy for Port Vila and in order to improve the current collection system and overcome the inefficiencies the following factors must be considered in a detailed analysis of how to improve the current situation:

1. Distance to disposal site
2. Suitability of individual household collection or communal bins
3. Size and type of waste receptacles
4. Conditions of roads and proximity to residences
5. Transfer station requirement
6. Size and type of collection vehicles
7. Frequency of service
8. Willingness to pay
9. Methods of charging and collection
10. Privatised operation or local government operation
11. Separation of policy setting, implementation and operations for collection and disposal of waste.

Recommendations

1. It is recommended that a review of the collection system arrangements in Port Vila is carried out and the following issues are considered:

- Privatisation versus municipality run services

-
- Public willingness to pay
 - Annual accounts for the waste collection and disposal system
 - Optimum waste receptacles
 - Effective monitoring and control – implementation and enforcement of the services to be provided or the contractual agreement
 - Segregated waste collection

4.1.3 Legislation/Regulation

One mechanism for waste reduction is to examine the imports to a country and identify which materials will lead to significant quantities of wastes. Action by the Government to reduce the imports that create wastes, through legislation or tariffs could be part of the waste management strategy. This type of intervention may not be appropriate due to the following reasons:

1. Reluctance to interfere with consumer choice
2. Contravention of World Trade Organisation agreements
3. Restricted sources of imported goods.

In the Vanuatu the use of legislation or tariffs to influence the purchasing and distribution policies for imported goods is a waste management option that should be considered in detail. Government can also have influence on the success of waste minimisation schemes through tax structures. The exemption of taxes for the export of recyclable materials from the Vanuatu or other tax incentives should be considered as part of the waste management strategy.

The Draft Environment Act is at present open for public comment but it is expected to be passed at the end of 2000. An important part of the waste management strategy will be the implementation of this legislation as well as improving the enforcement of the Public Health Act and local Litter Bylaws. Factors that need to be considered to achieve this are:

1. Which authority will have responsibility for implementing the Environment Act
2. Responsibility for policy setting and implementation of legislation
3. Multisectoral nature of waste management legislation
4. Number of officers for enforcement of Litter Bylaws
5. Training for enforcement
6. Level of fines
7. Regular review and updating of legislation
8. Financial resources for enforcement of legislation

Recommendations

1. Set up a working group to specifically examine and make recommendations on the implementation of the new Environmental Legislation.

4.1.4 Recycling

There are two basic approaches to recycling. The first involves separating recyclable materials at source (by the waste generator) and separately collecting and transporting these materials to recycling markets. The second involves collecting mixed wastes and separating these at a central processing facility. The key factors in the success of pre-separation efforts are the cooperation and willingness of the waste generator to participate in the programme over the long term, and the additional collection and transport costs that may be required. The success of centralised recycling plants depends on the processing costs and the quality of the recyclable material produced.

The highest recycling rates reported in 15 countries in 1990, were in the range of 10-18%. There are many good examples of successful recycling programmes throughout the world.

A major recycling impediment is the question of continued viability and availability of secondary materials market. The key points are:

- Recycling only occurs when the separated material is incorporated into a product that can be sold.
- Separation of materials does not constitute recycling – markets must be found first.
- Recycled products must be of a quality and price that compete in the marketplace.
- The difference in cost of disposal and recycling must be examined – ie. the price received for the recycled material, the waste collection and disposal costs avoided, the cost of separation, the costs of collection and processing the separated materials.

“The remoteness, relatively small size of the country and high degree of dispersion pose severe difficulty in transportation and market fragmentation. As a result, procurement of solid waste management tools, equipment, machinery, spare parts and even fuel is not only expensive but in many cases, very difficult to obtain. Very often the procurement encounters excessive delay. This situation also creates many constraints in waste recycling and

often renders many alternatives not feasible.” (Ref; World Health Organisation Publication titled “Healthy Cities – Healthy Islands)

The transportation of recyclable goods is one of the highest costs and can be higher than the return on the commodity carried. The opportunity to backload recyclable goods should be investigated in detail. The significant imbalance of imports to exports in the Vanuatu means that there are significant opportunities to utilise empty ships leaving Port Vila. Negotiation of appropriate shipping rates will also be critical to the viability of recycling in Port Vila. It is recommended that a working group is formed to examine the feasibility of shipping recyclable materials to Australia, New Zealand and Asia, including importers, shipping companies, container leasing companies, government and local government representatives.

Recycling has considerable to be potential, but is likely to be marginally viable in economical terms and may need to be subsidised by the community, government or another body wishing to dramatically reduce the amounts of material entering the landfill. Recycling of some materials might be feasible in Port Vila or within the Pacific Region. Government, community and business support will be critical to the success of recycling.

Recommendations

1. Form a working group on feasibility of shipping recyclable materials from Port Vila to overseas destinations.
2. Gain government and business support for implementing recycling in Port Vila.
3. Negotiate a deal for the recycling of materials that have been identified as feasible. Consider using the existing recycling agency (Vanuatu Recyclers) for increased metal recycling.

4.1.5 Incineration

Incineration/combustion processes use the controlled combustion of solid waste for the purposes of reducing its volume. The advantages are destruction of hazardous waste, reduction of volume by up to 90%, and the possibility of energy recovery. In Denmark, Switzerland and Luxembourg over 75% of the municipal waste stream is treated by combustion with energy recovery. In Sweden it is over 60%, in France 43% and in USA 17%. Japan uses waste combustion to treat over 75% of the waste remaining after recycling.

The disadvantages of incineration are high capital expense, complex technology, complex operations, air emissions and management of ash residues. Incineration in Port Vila has not been very successful to date as the Hospital incinerator and the quarantine incinerator are currently not in use due to poorly designed/selected equipment that is difficult to use.

The hospital has an incinerator that is in operation for destruction of medical waste.

Recommendations

1. Conduct a feasibility study on incineration for quarantine waste – either using the existing hospital incinerator or a new dedicated incinerator.

4.1.6 Sanitary Landfills

The disposal of waste to landfills continues to be the predominant method used worldwide. The 1990 International Solid Waste Association report indicated that the percentage of waste disposed of by landfills ranged from 20% to over 90% for 15 countries that were examined (Ref. Skinner, J.H. 1998. International Progress in Solid Waste Management in “Solid Waste in the Pacific”. Proceedings 6th Annual Conference, Christchurch 1994).

Open dumping of waste on land without adequate controls can result in serious public health and safety problems and severe adverse environmental impacts. Modern sanitary landfills are equipped with leachate collection systems, liner systems, systems for control of landfill gas, groundwater monitoring, closure and post-closure care plans. The objective is to ensure that the landfilling activities are performed in a manner that greatly reduces the chance of release of contaminants to the environment and that any release is quickly detected and corrected.

The issues that need to be considered in improved landfill management for Port Vila are:

- Sources of funding and financial constraints
- Short term and long term planning
- Technical expertise for operations and management of landfill
- Operations of leachate control system
- Daily filling and cover plan

The provision of sanitary landfill services is a critical component of the integrated waste management strategy for Port Vila.

Recommendations

1. A full review of operations and management of the landfill should be carried out and any recommendations implemented.
2. Review design and operations of leachate control system and monitoring bores and reinstate systems to operate according to appropriate plan.

4.1.7 Composting

Due to the quantity of biodegradable waste being produced in Port Vila it is recommended that composting be implemented as a major part of the waste management strategy. Composting produces a valuable product that can minimise the need to import expensive fertilisers. Composting is a well known technique and there are numerous proven operations around the world.

The issues that need to be carefully considered before implementing a composting scheme in Port Vila are:

- Composting at community level or household level?
- Initial funding
- What is the economic value of the product - can it be sold?
- Private scheme or government operated scheme?

Assuming a community or municipal scheme, there is at least 6,350 tonnes per annum of organic matter available in Port Vila based on the current waste generation figures. Assuming an 80% capture rate for this material and an average compression ration of 20 to 1 from loose green matter to finished product then there is approximately 1,000 cubic metres per annum of compost as product available. (This figure is conservative). Assuming compost could sell at Vatu 2,500/cubic metre (Aus\$30/cubic metre), there is a potential return of Vatu 2.5 million vatu per annum

(Aus\$30,000 per annum). Note: the value of the compost product in Port Vila will have to be determined.

Home composting has already proven to be successful in other Pacific Islands. Three key factors in the support of home composting are:

- Improvement in nutritional balance
- Waste reduction at source
- Reduction in importation of food items

Keys to successful home composting are – organise community group; use grass-root communications; and make the operation simple with use of local resources.

Recommendations

1. Build on the existing Sup Sup Garden Project to increase the number of home composting systems that are in use.
2. Implement a plan to expand the composting scheme at the Rainbow Gardens Nursery initially using more of the market waste, but increasingly using segregated household biodegradable waste once a segregated waste collection system can be implemented. Arrange contractual agreement with Rainbow Gardens.

4.2 Opportunities and Obstacles

A summary of specific opportunities and obstacles to the successful implementation of waste minimisation initiatives in Port Vila is highlighted in Table 4.2.

Table 4.2. Opportunities and Obstacles for Waste Minimisation in Port Vila

| Opportunities | Obstacles |
|---|--|
| Rainbow Gardens is willing to run a composting scheme using market waste delivered by the Council | Lack of funds for waste management initiatives |
| Landfill is well designed and located and can be operated to minimise adverse effects | Lack of public awareness on waste management issues |
| Metal recycling is viable and in operation – can be expanded | Poor management of existing waste collection scheme |
| Industry are generally willing to participate in schemes to improve waste management | Lack of public ability to pay |
| Likely to be a market for compost | Lack of public “perception of waste” |
| Plastic manufacturer interested in using biodegradable plastics | No financial incentive to segregate waste at source |
| | Small volume of recyclable material available |
| | Cost of shipping material to Australia or Asia for recycling |
| | Very little recycling carried out at present |

Further key opportunities that must be considered in justifying strategies and expenditure on solid waste management are related to the following significant environmental health impacts:

- **Fisheries** is an important economic resource which can easily be affected by improper solid waste management
- Protection of the “enchanted environment” as a valuable resource for the **development of tourism** is an important objective in the development of solid waste management. Tourism development has become an important economic strategy for the Vanuatu. Tidy towns, clean beaches and healthy people will definitely attract more tourists.
- **Health impacts** from contamination of the groundwater lens can be significant – protection of this vital resource is a priority in solid waste management
- Preventative measures to control the outbreak of infectious diseases through the improvement of solid waste management will improve the **cost-effectiveness of health care**.

4.3 Existing Markets

The only recycling that is being carried out at present in Port Vila is scrap metal recycling and glass bottle recycling at the Brewery. Paper recycling and tyre recycling have been tried in the past by BJS Agencies but these were not economically viable at the time.

| | |
|-------------------------|--|
| Scrap metals: | 30 Vatu per kilogram of metal About 32 tonnes per year recycled to Brisbane Two men employed full time |
| Glass bottles returned | 10 Vatu per bottle; 92-94% of bottles |
| Waste Oil per year from | Mobil exports 32,000 litres waste oil Unelco |

4.4 Potential Markets

Table 4.3 gives a rough indication of the prices at present in New Zealand and Australia paid for recyclable materials, the estimate of amounts available in Port Vila and the current estimate of shipping costs.

Table 4.3 Potential Markets for Recyclable Materials

| Material | Type | NZ\$/tonne (baled and shipped to NZ) | Aus\$/tonne (baled & sorted to Asia) | Amount available in Port Vila (tonnes/year) | Shipping cost Vatu per tonne |
|----------|------------------|--|--|--|------------------------------------|
| Glass | Colour sorted | 80 - 85 | | 295 | 6650 - 11,000 (NZ\$100-170) |
| Paper | Cardboard | 100 - 140 | 160 | 370 | 6650 - 11,000 (NZ\$100-170) |
| | Newspaper | 100 | | | |
| | Mixed | 40 | 112 | 495 | |
| Plastic | PET | Low density = 50 - 100 | | 27 | 6650 - 11,000 (NZ\$100-170) |
| | HDPE LDPE | High density = 350 - 440 | | 660 | |
| Metal | Al cans | 1,500 | | 320 | 6650 - 11,000 (NZ\$100-170) |
| | Steel cans | 25 | | | |

Note:

Low density = loose to less than 500 kg/m³

High density = 500 kg/m³

4.4.1 Glass Recycling

There is the potential for further glass recycling to be implemented at two levels - increase the volume of recycled bottles returned to the Brewery, and shipping of crushed glass to Australia, New Zealand or Asia for recycling.

4.4.2 Paper Recycling

Paper recycling is available in New Zealand, Australia and Asia. The waste paper is sorted and baled in NZ and shipped to Indonesia, Malaysia and Australia for processing. It is recommended that only two grades of paper be used for recycling in the Islands - mixed grade and cardboard grade. The key aspects to making a paper recycling operation successful are:

- big equipment to bail a large volume of material,
- sufficient capital behind the operation to invest in equipment,
- the ability to withstand the fluctuations in the market price,

-
- the ability to put a large weight of material in a container to economise on shipping costs,
 - the negotiation of cheap shipping costs,
 - the volume, form and quality of the material.

A small paper bailer would cost approximately NZ\$10,000 – 15,000 and could process about 5-6 tonnes paper per eight hour day. Operating costs and shipping costs must be kept to a minimum in order for paper recycling to be feasible. There is a significant amount of paper wastes that could be recycled.

4.4.3 Plastic Recycling

Plastics including PET, HDPE and LDPE are sent to Indonesia, Phillipines, Thailand and Australia for recycling. New Zealand can recycle HDPE. The process generally involves collection, sorting, grinding and packing before shipping to Australia or Asia for re-processing.

The sorting of plastics is more critical to the successful recycling of plastics. LDPE can only be processed if well sorted, HDPE is better if it is uncontaminated with other materials eg. Milk bottles are good, household chemical bottles require separation of parts. Clean plastic bags can be recycled also.

4.4.4 Metal Recycling

At present metal recycling is being carried out successfully by one well established private recycling business, BJS Agencies. There is the potential to significantly increase the volume of metal being recycled. It is recommended that a small working group is set up, including a representative from BJS Agencies, to identify what actions are needed and what support from government is needed to increase the amount of metal recycled.

4.4.5 Composting

Composting is identified as a highly favourable option as the process can be carried out locally thereby removing the requirement for transportation of goods. The process makes a valuable product that is useful in Port Vila. Composting has already been initiated on a trial basis at the Rainbow Garden Nurseries with the use of the Council owned shredder. This operations has been highly successful and many lessons have been learnt about the type of equipment required and the operating parameters for compost manufacturing. The current market price for soil products is:

-
- 2300 vatu per cubic metre soil
 - 78,000 vatu per cubic metre potting mix
 - 87,000 vatu per cubic metre Seed Mix

4.4.6 Prices for Recyclables

Table 4.3 gives prices for recyclable materials in 1992 in New Zealand as a rough indication of the value of various materials:

Table 4.3 1992 Prices for Recyclable Materials

| Material | 1992 Price (NZ\$/tonne) |
|-------------------------------------|-------------------------|
| Glass (broken and sorted by colour) | 58 |
| Glass bottles for reuse | 3-30 cents |
| Window glass | 45-75 |
| Cardboard | 80-100 |
| Newspaper | 10-40 |
| Mixed waste paper | 35-40 |
| Computer paper | 100-120 |
| Cardboard (kraft) | 60-80 |
| Plastics | 50-350 |
| Plastic film | 10-350 |
| Textiles (clean cotton) | 300 |
| Textiles (clean woollen) | 100 |
| Non-ferrous metals | 180-3000 |
| Scrap iron and steel | 30-150 |
| Car bodies | \$15 per car stripped |
| Household batteries | No market |
| Compost | \$5-7 per 40 litre bag |
| Compost (bulk) | \$50 per cubic metre |

4.4.7 Issues for Recycling from Pacific Islands to Overseas Destinations

1. Government needs to look at shipping costs
2. Container Leasing Companies need to be part of the negotiations
 - Is there a build up of containers in Port Vila that need to be transported back to another centre?
3. Shipping to a hub will be required eg. New Zealand, Australia or Asia
4. The frequency of shipping is a key factor
5. Mixed containers can be utilised eg. half plastic, half paper
6. 44 gallon drums can be used for compression of recycled materials such as paper, metal, cans, and crushed glass.

5. Alternative Integrated Solid Waste Management Activities

5.1 Introduction

Alternative integrated solid waste management systems have been developed emphasizing source segregation, collection, composting, reuse, recycling and resource recovery as well as collection, transfer and disposal to landfill. The alternative systems have been evaluated and ranked for feasibility and compatibility with the needs of Vanuatu. Ranking characteristics include:

- Capital costs
- Technical requirements
- Administrative requirements
- Operational requirements
- Ease of implementation
- Operation and maintenance costs
- By-products
- Political acceptability
- Social acceptability
- Environmental impacts

5.2 Implementation

The strength of an integrated waste management system lies in its working towards sustainability using an integrated approach and emphasizing prevention rather than cure. The waste management hierarchy is an important tool for prioritising actions. The definitions of levels of the hierarchy are given below:

- Prevention: covers methods whereby wastes or emissions are prevented from being generated at their source.
- Reduction covers methods whereby the quantity or hazardous nature of wastes and emissions are reduced at source.
- Re-use covers methods whereby waste and emissions are re-introduced to the same production process or re-used for the same purpose. These wastes do not require processing prior to re-use.
- Recycling covers methods whereby wastes and emissions are re-introduced to the same process or made available for use in another process. Recycling can occur on-site or off-site and the wastes and emissions usually require some form of processing prior to re-use.
- Treatment covers methods whereby wastes and emissions are altered in some way to reduce their quantity, concentration or hazardous properties.

-
- Disposal covers methods whereby wastes and emissions are eventually returned to the earth or the atmosphere.

Good waste management also depends on a partnership between all levels of government and the community. The success of recycling collection schemes can be highly variable. Often the collection and sorting of recyclables has been emphasized rather than the development of recycling schemes which produce marketable products. The future of recycling schemes is dependent on establishing viable markets for targeted materials.

Options for implementation of these integrated waste management strategies include the following:

- Through national environmental or waste management legislation
- Through health legislation
- Through local legislation and regulations
- Research, education and promotion of environmentally sound waste management practices
- Technical and general advice to authorities, operators and industry
- Voluntary measures such as codes of practice
- Economic instruments
- Bans of particular materials or products
- Systems for recovery

The options can be implemented at all levels of the community including the following groups:

- Central Government
- Local Government
- Waste collection and disposal operators
- Commercial waste producers
- Manufacturers
- Importers
- Domestic waste generators
- Special interest groups
- The public

5.3 Ranking of Alternatives

Table 5.1 gives a ranking from 1 to 3 for various waste management options against criteria including cost, social, environmental and technical criteria. A ranking of 1 is generally

indicates a more preferable options where 3 indicates a less preferable option. The cost criteria are added to give a costs total and cost ranking and then all criteria are added to give a total and overall ranking.

Table 5.1 Ranking of Waste Management Options against Criteria

| Criteria | Costs | | | | Effectiveness | | | | | | | | Overall | |
|--------------------------------|---------------|-----------|------------|--------------|------------------------|--------------------------|------------------------|-------------|----------------------------------|----------------------|---------------------|-----------------------|-------------|-----------------|
| | Capital Costs | O&M costs | Cost Total | Cost Ranking | Technical Requirements | Operational Requirements | Ease of Implementation | By-products | Political & Social acceptability | Environmental Impact | Effectiveness Total | Effectiveness Ranking | Grand Total | Overall Ranking |
| Waste Management Option | | | | | | | | | | | | | | |
| Disposal to landfill | 2 | 1 | 3 | 2 | 2 | 2 | 1 | 3 | 1 | 3 | 12 | 7 | 15 | 7 |
| Incineration | 3 | 3 | 6 | 5 | 3 | 3 | 3 | 3 | 3 | 3 | 18 | 8 | 24 | 9 |
| Municipal Composting | 2 | 2 | 4 | 3 | 3 | 2 | 2 | 1 | 1 | 1 | 10 | 5 | 14 | 6 |
| Home Composting | 1 | 1 | 2 | 1 | 1 | 1 | 3 | 1 | 2 | 1 | 9 | 4 | 11 | 3 |
| Recycling within country | 3 | 2 | 5 | 4 | 3 | 3 | 2 | 1 | 1 | 1 | 11 | 6 | 16 | 8 |
| Recycling overseas | 1 | 2 | 3 | 2 | 1 | 3 | 2 | 2 | 1 | 2 | 11 | 6 | 14 | 6 |
| Reuse | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 1 | 3 | 1 | 10 | 5 | 12 | 4 |
| Legislation to ban products | 1 | 1 | 2 | 1 | 1 | 2 | 3 | 1 | 3 | 1 | 11 | 6 | 13 | 5 |
| Legislation to tax packaging | 1 | 1 | 2 | 1 | 1 | 2 | 3 | 1 | 3 | 1 | 11 | 6 | 13 | 5 |
| Segregation at landfill | 2 | 2 | 4 | 3 | 2 | 2 | 1 | 1 | 1 | 2 | 9 | 3 | 13 | 5 |
| Segregation at source | 1 | 2 | 3 | 2 | 1 | 2 | 3 | 1 | 2 | 1 | 10 | 5 | 13 | 5 |
| Education programme | 2 | 1 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1 | 9 | 1 |
| Media Campaign | 2 | 1 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 7 | 2 | 10 | 2 |
| Glass recycling to supplier | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 7 | 2 | 9 | 1 |
| PET recycling by Cococola | 1 | 1 | 2 | 1 | 3 | 1 | 2 | 1 | 1 | 2 | 10 | 5 | 12 | 4 |
| Paper recycling | 1 | 2 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 10 | 5 | 13 | 5 |
| Metal recycling | 1 | 2 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 8 | 3 | 11 | 3 |

Note:

1. Cost total is equal to the sum of rankings for capital costs and O&M costs.
2. The effectiveness total is equal to the sum of rankings for technical and operational requirements, ease of implementation, by-products, political and social impact and environmental impact.
3. Overall total is equal to the sum of ranking for all criteria.

Based on the criteria described under effectiveness the prioritised options would be as follows:

Effectiveness Priorities

- 1 Education Programme
- 2 Media campaign / Glass recycling to supplier
- 3 Segregation at landfill / Metal recycling
- 4 Home composting
- 5 Municipal composting / Reuse / PET recycling by Cococola Amatil / paper recycling / Segregation at Landfill
- 6 Recycling both within Port Vila and overseas / Legislation to ban or tax products
- 7 Disposal to landfill
- 8 Incineration

This ranking process gives the following overall priorities for waste management options in Port Vila:

Overall Priority

- 1 Glass recycling to supplier / Education programme
- 2 Media campaign
- 3 Metal recycling / Home composting
- 4 PET recycling by Cocacola Amatil / Reuse
- 5 Paper recycling / Legislation to tax or ban products / Segregation of wastes at landfill
- 6 Municipal Composting / Recycling overseas
- 7 Disposal to landfill
- 8 Recycling within Port Vila
- 9 Incineration

6. Rate Structure for Finance Waste Management Activities

This section of the report assesses the capital and operational costs of the waste management programmes and the benefits of income generating waste minimisation activities. Recommendations are made on fee collection systems/disposal costs.

6.1 Cost Priorities for Waste Management Options

Based on the ranking procedure carried out in Table 5.1 above based on cost criteria only the following priorities were determined for Port Vila:

Cost Priority

- 1 Glass recycling to supplier / Legislation to tax or ban products / Reuse / Home composting / PET recycling by Coca cola Amatil
- 2 Education programme / Media campaign / Segregation at source / Recycling overseas / Paper recycling / Metal recycling / Disposal to landfill
- 3 Segregation at landfill / Municipal composting
- 4 Recycling within country
- 5 Incineration

6.2 Recommendations on Fee Collections

The current rate structures for waste collection and disposal are given in Table 6.1 below for the eight countries in the Pacific that have been studied are part of the SPREP Waste Characterisation and Management Plans Study.

Table 6.1 Comparative Costs of Waste Collection and Disposal

| Country | Collecti on per week | Domestic Waste | Commercial Waste | Industrial | Tip Fees | Skip/Bi n (per load) |
|--------------------------|----------------------|--|------------------------------|--|--|------------------------------|
| Solomon Islands - SBD | 1 - 2 | Free | 2.50/ collection (Aus\$0.79) | 5.00/ collection (Aus\$1.59) | Free | |
| Fiji - FJS | 2 - 3 | Free | Free | - | 3.30 (\$2.5) - household 5.50 (\$4.30)- trade/ commer. 16.50 (\$12.85)- condemned 22.00 (\$17)- hazardous | 30 (Aus\$23) |
| Vanuatu - Vatu | 3 | 6,000 (Aus\$72) | 9,000 (Aus\$108) | 60,000 - 360,000 (restaurants - hotels) (Aus\$722-4,337) | 100 - car (\$1.2) 200 - Hilux (\$2.4) 300 -Lorry (\$3.6) 1,500 - Disclutcher (\$18) | 2,500 - 3,500 (Aus\$30 - 42) |
| Tonga - Panga | 1 - 2 | 6 (Aus\$5.77) | 12 - 18 (Aus\$11-17) | 24 (Aus\$23) | Free | - |
| Kiribati (Aus\$) | 1 | (Aus\$17 - 29) | (Aus\$50 - 600) | - | Free | - |
| Tuvalu (Aus\$) | | (Aus\$30 10/load green waste) | (Aus\$100 - 400) | - | Free | 15 |
| Samoa | 2 - 7 | Free | Free | Free | Free | - |
| Papua New Guinea (Aus\$) | 1-7 | 120 - 420 (Aus\$60 - 208) (small) 395 - 1380 Aus4\$196 - 685) (2401) | 240 - 1380 (Aus\$119 - 685) | | 2(2.5) - car/utility 7(3.5) -1.5Tonne 10(5) -K600 Truck 8(4) -industrial bin | |
| New Zealand (Aus\$) | 1 | 185 (Aus\$145) 6.5(Aus\$ 5.10) - recyclables | | | 50 (Aus\$39) | |

Note:
 Figures given in brackets are in Australian Dollars.
 All other figures are in the local currency.

The table above shows that the charges for waste collection and disposal in Port Vila are low compared with other Pacific Island countries. In Western societies the rate structure for waste management is moving towards full cost recovery. Full cost recovery for waste collection and disposal in Port Vila is the ultimate aim. However the public “ability to pay” is a significant factor to be considered in Port Vila. It is recommended that the costs of waste collection and disposal are accounted for on an annual basis and that charges are set for the public based on a

survey of “ability to pay”, with increases towards full cost recovery over the medium term.

It is also recommended that a gate fee for using the landfill be implemented as this is an area where there is not enough revenue to maintain the facilities adequately. Records of vehicles entering the landfill and the amount collected should be kept as part of the daily operations.

7. Integrated Solid Waste Management Plan

7.1 Objectives of the Plan

The objectives for the Integrated Solid Waste Management Plan for Port Vila are:

1. To create a framework for solid waste management in Port Vila that integrates all levels of solid waste management from legislation, government involvement, municipal council management, waste management operations, businesses, community bodies and the public.
2. To ensure that solid waste is managed in the most appropriate manner for Port Vila and the people that live there, both economically and environmentally.
3. 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 will provide a basis for prioritising actions required by waste managers in Port Vila in the short to medium term.

The Plan will be based on the information as presented in this report as well as economic factors, regional waste management activities and international best practice in solid waste management. The Plan will take into account the current situation for solid waste management in Port Vila, the current waste generation rates and waste classification data. It will also look at factors such as future solid waste generation, population changes, wealth, social change, education, markets for recyclable materials and regional influences.

This draft report only discusses some of the priorities and options that have been identified during the fieldwork in Vanuatu that may be incorporated into the final solid waste management plan. Other issues such as institutional strengthening and financing of options will need to be addressed for the implementation of the Plan.

7.2 Waste Minimisation

- Implement segregated municipal waste collection for all recyclables
- Increase the quantity of aluminium and other non-ferrous metals recycled through existing scheme by increased publicity and education and improved collection scheme. Commercialise the existing scheme or initiate a new scheme to ensure on-going success.
- Designate an area for green waste dumping at the current landfill. Notify the public of the change to segregated collection and dumping of green waste. Arrange for separate municipal collection of green waste.
- Sign agreement with Rainbow Gardens to implement a larger scale pilot project for composting of market waste and green waste collected and delivered to Rainbow Gardens.
- Negotiate a subsidised or cheap option for shipping of waste materials to Australia, New Zealand and Fiji etc. Consider using legislation or regulation to achieve this.
- Implement a packaging legislation to create an incentive for return of packaging for recycling eg American Samoa has recently implemented legislation.
- Implement a separate paper collection and buy a shredder and baler to ship paper waste overseas (Australia) for recycling.
- Government to investigate the possibility of setting up a waste management fund for the support of waste minimisation and recycling schemes in Vanuatu.
- Local government /Government to review the implementation and support for a business to crush large thin gauge steel

waste items such as car bodies and whiteware, for recycling overseas.

- Negotiate with the brewery to collect waste glass in Port Vila and send to Australia for recycling.
- Investigate a hotel/resort pilot project for waste minimisation including recycling, composting and purchasing policies.

7.3 Refuse Collection

- Consider and plan for the implementation of a segregated municipal waste collection service in Port Vila – for green waste, glass, metals, PET and paper.
- Purchase more wheelie bins for domestic collection. Utilise 120 litre bins for households instead of 240 litres.
- Obtain funding to have the collection trucks fitted with hydraulic lifting gear and implement in a sequential basis over a period of time so that staff can be moved to other areas of work.
- Put in place a system to annually review the waste collection and tipping fees in order to move towards full cost recovery for waste management.

7.4 Disposal of Refuse to the Landfill

- A management plan for the operation of the current landfill site should be prepared to ensure that it is operated in a safe manner that minimises adverse effects on the environment. The plan will cover aspects such as monitoring of vehicles, monitoring of waste on a regular basis, plan for trench filling, monitoring of bores, leachate control, management of hazardous wastes, methods for daily cover of waste, pesticide control and segregated dumping for green wastes and organic wastes.
- Conduct regular management meetings with representatives from all stakeholders in the operation of the landfill eg. Municipality, Public Works Department, Environment Unit and Unelco (water quality testing).
- Put systems in place to stop the dumping of oily and hazardous waste into the leachate ponds

-
- Identify funding for establishing the original proposed leachate control system
 - Identify the monitoring boreholes that were installed and put in place a plan to monitor all three bores regularly.
 - Implement a programme to monitor and record the water quality at wells in the closed Fres Wota Dump.

7.5 Special Wastes

- Initiate a waste oil disposal system in conjunction with the oil companies. Implement an oil collection depot at the landfill or at one of the oil company premises.
- Publicise and implement waste pesticide container collection. Investigate options for disposal.
- Implement a collection system for used batteries and investigate the proper disposal of them.
- Develop a hazardous waste classification and management system.
- Ensure that new legislation defines who is responsible for hazardous waste and that the waste generator will be responsible for proper disposal
- Implement a “yellow bag” system of hazardous medical waste collection at the hospital. Stop burnign hospital waste at the landfill and use the incinerator.

7.6 Community Involvement

- Education programme to raise public awareness of solid waste management principles and waste minimisation concepts. Concentrate on primary and secondary schools, businesses, church groups and women’s groups in the community.
- Investigate curriculum changes to incorporate waste minimisation education into schools.

-
- Publicity on new recycling schemes and segregated collection systems eg. Posters, pamphlets, radio interviews, television
 - School collection scheme for recyclables
 - Implement an education programme for tourism and hotel/resort operators in waste management and minimisation, through the Hotels/Tourism Association
 - Implement an education programme for the business community in waste minimisation through the Chamber of Commerce.

7.7 Organisation of Solid Waste Management

- Appoint a Solid Waste Management Officer to organise solid waste management and waste minimisation in Port Vila and to liaise between the Department of Health, Department of Environment, recyclers, local businesses and the public as well as international organisations that can assist in solid waste management in Vanuatu.
- Identify responsibilities, funding and staff for the improved enforcement of littering and illegal dumping of wastes.
- Prepare an action plan for the management of hotel and tourism related waste.

7.8 Implementing the Plan

- Hold a workshop with government ministers, NGOs, business and community leaders, DoH and, Department of Environment, Department of Education, waste recyclers and community leaders. Discuss, revise and agree on the components of the Plan. Prioritise actions, responsibilities and timeframe for the Plan. Set measurable targets for waste minimisation.
- Form a Solid Waste Committee with representation of all waste managers, government and community, to set and monitor on-going waste minimisation objectives.
- Obtain Government or overseas agency funding to implement a demonstration scheme for PET recycling and paper recycling (recycling to Australia). Monitor the costs and success of the project for future privatisation of the schemes. Obtain business and community support and involvement eg. school collections of PET bottles with Coca-Cola providing refunds, or prizes for best collections.
- Review local, national and international funding of on-going waste management and waste minimisation projects (both in urban and rural areas), to identify new and increased levels of funding.

Appendix A - Terms of Reference

Appendix B - Study Methodology

Appendix C - Curricula Vitae

Appendix D - List of Contacts

Vanuatu : List of Contacts

| Name | Organisation/Company | Position | Phone/Fax |
|-------------------------------------|--|--|--------------------------|
| Ernest Bani | Environment Unit, Department of Lands, Survey and Natural Resources | Head | Tel: 25302 Fax: 23565 |
| Albert Williams | Port Vila Municipality | Assistant Environmental Health Officer | Tel: 22113 Fax: 25002 |
| Karen Preston | Foundation for the Peoples of the South Pacific | Country Director | Tel: 22915 Fax: 24510 |
| Michael Vari | Foundation for the Peoples of the South Pacific | | Tel: 22915 Fax: 24510 |
| Elison Bovu | Foundation for the Peoples of the South Pacific | | Tel: 22915 Fax: 24510 |
| Russell Nari | Environment Unit, Department of Lands, Survey and Natural Resources | | Tel: 25302 Fax: 23565 |
| Viran Tovu | Department of Health | | |
| Gedian Romoleo | Port Vila Hospital | | |
| Jo Dorras | Wansmolbag Theatre Group | Script Writer | Tel: 27119 Fax: 25308 |
| Bob and Cornelia Wylie | Rainbow Gardens | Manager/Owner | Tel: 24720 Fax: 27321 |
| Glenn Niouvenmal Jacques Nioteau | Mobil | Health, Environment and Safety Officer | Tel: 22332 Fax: 22736 |
| Trinson Tari | Environment Unit | | Tel: 25302 Fax: 23565 |
| Gary Stevens | Pacific Suppliers Ltd | Managing Director | Tel: 25082 Fax: 25256 |
| Gregoire Nimbtik | Department of Economic and Social Development | Sectoral Analyst | Tel: 23306 Fax: 23088 |
| Bruno Blondel | BHP Steel Buildings | Manager | Tel: 23261 Fax: 25906 |
| Owen Mete | Iriki Island Resort | | Tel: 23388 |
| Kerry Manessah | Vanuatu Trading Post | | Tel: 23111 |

| Name | Organisation/Company | Position | Phone/Fax |
|----------------------|----------------------------------|------------------------------------|--------------------------|
| Tony Tevi | Government | Geology/Mining and Water Resources | Tel: 22423 |
| Emma Iverach | Cellovila | Manager | Tel: 22797 Fax: 22799 |
| Michael Oltman | Centre Point | Managing Director | Tel: 22631 Fax: 23746 |
| Toco Mara | Chamber of Commerce and Industry | Training Coordinator | Tel: 27543 Fax: 27542 |
| Mr S.R.Rao | Asian Paints Ltd | General Manager | Tel: 25968 Fax: 25965 |
| Mathew Young | Le Lagon ParkRoyal Resort | Acting Manger | |
| Murray Parsons | Vanuatu National Brewery | Manager | Tel: 22963 |
| Ken Hutton | Vanuatu Recyclers | | |
| Francois Py | Unelco | | Tel: 22211 |
| George Henry / Edwin | Vanuatu Beverage | | |

Appendix E - References

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- 4 Royds Consulting. Volume 2: Final Master Plan, Sanitation Master Plan for Port Vila; Asian Development Bank TA: 2597-Van April 1998
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- 10 Suresh, Raj. Duty Travel Report – Lome IV Pacific Regional Waste Awareness and Education Programme. Project No 7 ACP RPR 584 (Reg/7714/000). October 1998

Appendix F - Notes of Initial Project Meeting and Final Workshop

Initial Meeting Notes 22 September 1999 at the Environment Unit, Port Vila

Present:

| | |
|-----------------|------------------------------|
| Juliet Woodward | Sinclair Knight Merz |
| Andrew Reeve | Sinclair Knight Merz |
| Albert Williams | Port Vila Municipality |
| Ernest Bani | Environment Unit, Government |
| Elison Bovu | FSP Vanuatu |
| Karen Preston | FSP Vanuatu |
| Michael Vari | FSP Vanuatu |
| Viran Tovu | Department of Health |
| Jo Darras | Wansmolbag |

- 1 Welcome from Ernest, described what we need to achieve at the meeting.
- 2 Suresh gave the background to the Waste Awareness Programme - this includes three parts: the waste classification and management plans and pilot projects (+waste minimisation and management project FSP which includes a baseline survey of awareness and study into legislation and why it is not working); education and awareness (SWEAP project); legislation.
- 3 This project is concentrating on waste classification, operations and engineering
- 4 The FSP waste minimisation project will be holding 2-3 workshops - the timing of the data production from the waste classification project needs to fit in with this timeframe.
- 5 This project will come up with a technical plan with priorities for implementing specific projects.
- 6 FSP is doing recommendations on policy.
- 7 There will be FSP workshops on waste management in the provinces (rural areas). The waste classification project will have drafted recommendations before the high level meeting.
- 8 Albert is very keen on waste classification for Port Vila.
- 9 Andrew gave an overview of our project.
- 10 Juliet talked about the project activities and needs.
- 11 The DoH was involved in a waste campaign at the beginning of the year - will be looking at a tyre collection + other vector disease waste containers.
- 12 Rural area dumps are a big problem - the PWD is responsible for provincial centres. Villages look after themselves.
- 13 There is a weekly schedule for collection system.
- 14 In 91-92 there was a baseline report done and the landfill was built in 1995.

15 Who should be audited? – Hospital, Quarantine waste is burnt at the landfill, hotels – Le Meridian, Park Royal, Iririki, Melanesian, Supermarkets – Au Bon Marche, Centrepont; Vate Industries, BHP, Asian Paints, Centre Garage, Motor Traders, Cello Villa, Pacific Supplies, Vanuatu Beverage, National Vanuatu Brewery, Ken Hutton, Chamber of Commerce.

16 There are no scavengers at the landfill.

17 Cans and bottles on the beach are a big problem.

18 There are 5 trucks, but only 3 are working at present.

19 The Ifira Trust does a rural collection and has 1 vehicle.

20 Should visit the Statistics Office (Peter Morris).

21 FSP did a study on waste oil 5 years ago - will get the report.

22 Need a letter of introduction for the interviews.

23 Should visit the Kiwanis group as well.

24 Household collection is 3 times per week and commercial is 3 times per week. Restaurants and hotels are now 3 times per week. The market has 10m³ skips.

25 There was a master plan produced last year – Albert will get it.

26 Albert will arrange for access to a weighbridge.

27 There is the following equipment:

- 2 x 10m³ trucks 2 year old
- 1 x 11m³ truck 9 years old
- 2 x 7 m³ trucks 5 years old
- x 7m³ skips
- x 10m³ skips

28 The landfill area is approximately 30 acres.

Appendix G - Excel Spreadsheet of Waste Classification Data

Appendix H - Excel Spreadsheet of Vehicle Survey Data

Appendix I - Notes of Meeting with Industry

Meeting at: Foundation for the Peoples of the South Pacific
Port Vila, Vanuatu
Date: 23/9/99
Attending: Juliet Woodward
Andrew Reeve
Suresh Raj
Albert Williams
Karen Preston
Michael Vari
Ellison Bovu

- 1 There is a project advisory committee.
- 2 They will be undertaking consultation through a workshop with Ministry of Internal Affairs, planners, Public Works Department, Education, Health, Councillors.
- 3 Viewing of the provincial dumps and consultation in each of the 3 provinces.
- 4 Will produce a combined set of recommendations.
- 5 The Municipality will be done separately (separate document).
- 6 Environmental legislation is being drafted (ready in 2000) which includes recommendation for waste management. There will be Policy recommendations.
- 7 Comments on the legislation are being accepted until the end of the year, then there will be another draft. In reality the law might not be in place until the end of 2000. Will get a copy from Ernest and review it on a technical basis.
- 8 The Public Health Act is undergoing review and will be condensed.
- 9 There is a Food Act that deals with contaminated food disposal.
- 10 The Property Tax includes waste management fees.
- 11 Want incremental changes to the waste charges.
- 12 Bins have been introduced - 400 x 240 litres wheelie bins, cost Vatu 30,000 in total.
- 13 The distribution of the bins is erratic.
- 14 Could change the collection charges to be based on bin size.
There is no hydraulic lifting for the bins on the trucks
- 15 FSP will audit 2 schools.
- 16 Students are involved in clean up programmes. There used to be a clean village competition. There is National Health Week. The Director of Curriculum Development (Mrs Susan Barlao) is keen on developing material. Currently they do conservation in year 7 (aged 12 or 13) and Years 1-6 do Health, Nutrition and Agriculture. In Fiji there is a pilot project called Live and Learn Environment, by Christian Nielsen (based on Australian

programme). FSP would like to develop links between education bodies, NGOs and Live and Learn.

17University of South Pacific do environmental law.

18The Labour Department has H+S Officers; the Commissioner of Labour is very keen to get involved.

Meeting at: Environment Unit, Dept of Lands Survey and Natural

Resources.
Port Vila, Vanuatu

Date: 23/9/99

Attending: Juliet Woodward
Andrew Reeve
Suresh Raj
Russell Nari
Albert Williams

- 1 Picked up a copy of the draft environmental legislation.
- 2 The current Municipality By-laws allow for charging for waste
- 3 The Dept. is negotiating a contract with the old consultant to return and finish drafting the legislation.
- 4 Concern about issues, no real legislation at present, can only advise, no real mandate for control of waste management.
- 5 Litter, solid waste, effluent from small businesses/garages/spray painting, public littering is a real problem.
- 6 The priority is education for the public.
- 7 There is no enforcement of littering at present – trying to get by-law for enforcement of littering (Disposal of Litter By-law), need review of existing By-law.
- 8 Need more consultation with public for new laws and by-laws. Have had 2 national workshops in all provinces with all stakeholders.
- 9 Want to do a 1 week workshop to discuss every piece of the new act.
- 10EIAs for the operation of the landfill will be required.
- 11The Public Health Act is under review.
- 12Drilling of boreholes at the landfill was carried out but they cannot find them now – there has been no monitoring in 3 years.
- 13The front end loader is at the landfill every day
- 14There is no daily management plan for the landfill – this is needed
- 15The Environment Unit is under-resourced at present. It is run purely on overseas funding. Salaries are paid by the government.
- 16There is not enough funds from the government for environmental activities.
- 17Trying to set up an environmental trust fund based on tax from tourists – to pay for biodiversity.
- 18Trying to set up alternative income generating enterprises based on eco tourism eg the Fata Conservation Area in Santo.

Community reserve areas have been set up to protect conservation/marine areas.

19 Awareness and education is the main priority for the Environment Unit.

20 Tuvalu has a plastic bag charge now - 20cents per bag. But Vanuatu has no tax for importation of goods - only 12.5%VAT.

Meeting at: Port Vila Municipal Council
Port Vila, Vanuatu
Date: 24/9/99
Attending: Juliet Woodward
Andrew Reeve
Suresh Raj
Ellison Bovu
Michael Vari
Albert Williams

- 1 Information sent out as an introduction to the FSP waste minimisation project to all stakeholders.
- 2 Want to form a committee including the Municipality, Chamber of Commerce, DoH, FSP, Environment Unit and Dept of Internal Affairs, to oversee the implementation of the project.
- 3 A Press release should be prepared.
- 4 There are existing reports on the landfill design – Toni will get these.

Meeting at: Wansmolbag
Port Vila, Vanuatu
Date: 24/9/99
Attending: Juliet Woodward
Jo Darras
Lucy
Mirinda

- 1 People in Vanuatu have no idea of waste separation.
- 2 There is no enforcement of anti-littering - this is a big problem.
- 3 Have done a litter play already to primary schools - did not feel that it was very effective, however there is no way of measuring effectiveness. Would like to do another one.
- 4 There are not enough rubbish bins around town.
- 5 A play should be part of a bigger education scheme.
- 6 The environment, health and good governance are favourite areas for Wansmolbag education at the moment - marine life, ethnobotany, WWF, logging, forestry, and turtle campaign are some examples.
- 7 There is not very good awareness about waste on beaches.
- 8 People keep their yards clean but they litter outside.
- 9 Schools teach composting as part of the agriculture course but in some schools there is also a demonstration composting scheme.
- 10 Education through plays would be difficult if the demonstration schemes were not in place.
- 11 Could help with the Aluminium recycling scheme.
- 12 A 20 minute video in schools with a workbook could cost 4-6,000,000 Vatu.
- 13 They do a lot of work with teachers and primary schools and 5 high schools - are working with teacher training already.
- 14 Radio is a big area for education - have done an 8 part soap already. Could do a short film on waste management - visual would be more effective for waste management.

Meeting at: Centre Point Supermarket
Port Vila, Vanuatu
Date: 24/9/99
Attending: Juliet Woodward
Michael Oltmann
Albert Williams
Michael Vari

- 1 Shopping bags are used – they cost Aus\$27 per thousand bags, or about 2.5 Vatu for a big bag and 1.5 Vatu for a small bag
- 2 They spend 6-8,000,000Vatu per year on trays and bags and tear off bags; and approximately 400,000Vatu per year on big and small bags.
- 3 Would like to use less plastics- feel customers would not accept it.
- 4 Would like to use cartons for packing as their waste is about 90% cartons.
- 5 Meat waste and kitchen waste goes to a pig farmer.
- 6 Office waste is shredded
- 7 Believes there is about 10% paper and plastic wastes
- 8 Any products that are past their use-by date are sent to the landfill.
- 9 On Fridays they use a skip from the Council – 10m³ takes 2 days to fill. Costs 120,000 Vatu per year + 15,000 Vatu per month for the skip. The collection is daily except Friday and Saturday.
- 10 Estimate about 3,900 m³/year of waste to landfill.
- 11 No waste minimisation other than trying to use cartons instead of plastic bags for packing.
- 12 All goods are pre-packaged , have no bulk bins.
- 13 There is not much bulk buying by consumers because they do not have enough money.
- 14 Thinks the recycling of bottles is not working very well – a bottle is worth 42 Vatu and they pay 10 Vatu for collecting it.
- 15 Pallets are used for firewood.
- 16 There are no refill packs of cleaning chemicals.
- 17 Damaged goods go to the landfill
- 18 Are working with Kiwanis to encourage the reuse of plastic bags.
- 19 Public have changed completely and now reject products that are past their use by date.
- 20 Will not charge for plastic bags unless there is a regulation requiring all supermarkets to do it.
- 21 Very interested in reducing packaging waste and environmental concerns.

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- 22 Thinks waste management initiatives should be through the Municipality or the Government.
- 23 Shipping costs for wastes out of Vanuatu should be free, as they are going back to Australia empty at the moment – they have a monopoly so can charge anything.
- 24 There is one shipping line per destination – Australia is Chief Container Services, Hong Kong is Crater Bali Hai.
- 25 Petrol station opposite has waste oil – doesn't know where this goes.

Meeting at: Pacific Cleaning Chemicals
Port Vila, Vanuatu
Date: 25/9/99
Attending: Juliet Woodward
Gary Stevens
Albert Williams

- 1 Interested in compactor trucks and bins – wants a better system, with hydraulic lifting. Have researched systems in Japan, Australia and Tokyo. A mechanised system of collecting waste was planned originally - there was A\$100,000 given for the equipment. Wants to sell trolley bins.
- 2 They are a chemical manufacturer and wholesaler; supply to hotels, airlines, hospital. Make cleaners, disinfectants, sodium hypochlorite, swimming pool chemicals, water treatment chemicals. Do blending only, all sold to local market at present. There are 9 staff and the premises is about 200m².
- 3 Le Meridian Hotel and the Hospital have a problem with wastewater treatment at present
- 4 25kg bags go to the landfill.
- 5 Fill a 150litre trolley bin per week, with plastic bags, plastic weave bags, broken containers, cartons, and shredded paper. Waste is collected 3 times per week
- 6 Plastic drums are sold for water storage
- 7 Waste is collected 3 times per week.
- 8 Will take back plastic containers if they are returned, do collect them from hotels sometimes. They import 4-5 tonnes of plastic containers per year.
- 9 At the Star Wharf the Ifira Trust accept waste materials for filling in the wharf area.
- 26litres drums are recycled, about 1000 per year. Also 20-30 x 5litre drums, 20-30 x 5 kg pails, 20-30 x 15 kg pails.
- 10They avoid refunding for containers, refunds are on an informal basis, ie there are no deposits on containers.
- 11Staff are encouraged to recycle containers.
- 12Would be willing to help with recycling if it is viable.

Meeting at: Asian Paints Ltd
Port Vila, Vanuatu
Date: 25/9/99
Attending: Juliet Woodward
Mr. S. Rao
Albert Williams

- 1 Manufacture paints – 60% water based paints and 40% oil based paints. The business is 7 years old.
- 2 Their wastes are paper (80%), plastics, cans (10%), strapping, washings – sludge, grass and green waste.
- 3 Solvent is reused after settling of the sludge. There is liquid effluent produced from water washings after alum treatment.
- 4 They take a small truck (0.5 tonne) to the landfill. 2 trips every 10 days. About 100-150 kg sludge is dumped once per 6 months in metal drums. Average of about 1-1.5m³/week
- 5 Powders are in paper bags; liquids are in 44 gallon drums or plastic drums.
- 6 Water washable drums are reused in the process then given away. Solvent drums are reused then given away.
- 7 Produce about 12-14,000 litres paint per month, maximum of 23,000 litres per month. 95% is for local supply and 5% for export (specialised heavy duty products.
- 11 staff.
- 8 Only get a batch going off about twice in 7 years, it can be then converted to another product rather than being thrown away.
- 9 Some materials are bought in bulk volume eg. 44 gallon drum
- 10 Some raw materials are on shrink wrapped pallets
- 11 Have a H&S policy for pigments eg. Cobalt, Mg, Zn.
- 12 Emulsions can go bad – these are dumped at landfill (only 1-2 in 7 years)
- 13 Staff are educated about what can be dumped.
- 14 Would be willing to help with waste recycling.
- 15 Produce about 1500 – 2000 x 4 litre pails, 300 x 20 litre pails, 1000 litres in small cans
- 16 Use nylon filters to filter paint, there are reused and then through away.
- 17 Sludge is about 60 litres every 6 months.
- 18 Wastage during the process is usually about 1%

Meeting at: BHP Steel and Building Products
Port Vila, Vanuatu
Date: 25/9/99
Attending: Juliet Woodward
Andrew Reeve
Bruno Blondel
Albert Williams

- 1 Produce roofing material for Vanuatu.
- 2 Waste sheet metal offcuts - do not have a machine to re-process them.
- 3 About 1.5m³ mixed waste per week goes to the landfill using their own truck.
- 4 The amount of offcuts depend on what has been ordered and on the cutting machine. Also some of the cutting machines are crooked so they make more waste offcuts.
- 5 There are about 7 staff and the premises is about 450m². Produce about 35-40 tonnes per month, and about 500kg waste per month.
- 6 They need planning to minimise the waste from each job but often the staff are not educated.

Meeting at: Cello Villa
Port Vila, Vanuatu
Date: 25/9/99
Attending: Juliet Woodward
Ms Emma Iverach
Albert Williams
Andrew Reeve

- 1 Produce toilet paper, kitchen towels, cardboard, plastic bags (LDPE, HDPE) and a chemical range including commercial and domestic cleaning chemicals (packing only – 40 tonnes/month.
- 2 Paper is from NZ, Plastics are from Noumea, Chemicals from Australia (come in 200 litre drums and 25kg bags)
- 3 Waste is approximately 90% waste, 10% plastic, 1% chemicals. Waste is collected twice per week and costs 74,000 Vatu per quarter.
- 4 Paper waste are recycled and used by schools as oil absorbent or fibre glass absorbent. Waste plastic is not recycled.
- 5 A 120litre bag costs 27Vatu per bag (top price).
- 6 They weight the wastage plastic to check efficiencies. There is waste minimisation training for staff.
- 7 Business is Noumean owned.
- 8 They reuse plastic containers. Cartons are reused for shipping. Sacks are reused at home.
- 9 They refill containers at a discount for customers that bring them back.
- 10A 20litre container costs Aus\$7.50.
- 11Small products e.g. mortein, is sold to the islands in cartons.
- 12Also sell foam trays and plastic cups and plates etc.
- 13Office waste is burnt.

Meeting at: Le Lagon Parkroyal
Port Vila, Vanuatu
Date: 26/9/99
Attending: Juliet Woodward
Mathew Young Acting Manager
Maintenance Manager

- 1 There are 141 rooms, 320 guests with an occupancy rate of 74% average. There are 2 restaurants, a barbeque, 3 bars and a function room.
- 2 A 10m³ skip is collected every 2 days and a 7 m³ skip from the golf course every 2 days
- 3 Papers are burnt
- 4 Garden waste is dumped.
- 5 Office paper is recycled.
- 6 Cans are dumped
- 7 Beer bottles are returned.
- 8 Kitchen waste is 25 x 240litre per day. 4 pig farmers collect kitchen waste.
- 9 Air conditioner units are dumped
- 10 Shampoo and conditioner bottles are refilled.
- 11 Hotel buys in bulk. Tries to support local businesses.
- 12 Waste cooking oil is dumped.
- 13 Would be willing to participate in any waste minimisation schemes.

Meeting at: Ken Hutton
Port Vila, Vanuatu
Date: 26/9/99
Attending: Juliet Woodward
Ken Hutton

- 1 Pays 30vatu per kg metal – aluminium, copper, brass
- 2 Collects from hotels clubs, school children. Also has someone who goes to the tip to get large metal items.
- 3 Sends to Brisbane to Tools Ingots.
- 4 Can collections started as a Kiwanis project but is became too commercial for them. Now Ken Hutton does it alone. He does it to help keep the town clean.
- 5 Recruits girl guides to collect cans after events.
- 6 Sends 2 containers per year – 20ft cubic foot, 16-18 tonnes.
- 7 Gets copper wire from Unelco and taps and brass fittings from plumbers, and old ship fittings.
- 8 Have been around restaurants asking them to collect cans but some do not participate e.g. Club Vanuatu.
- 9 Last year sent 5 containers, because there was a lot of TV cables.
- 10 Only getting about 50% at present.
- 11 Ifira Shipping charges 15,000 vatu for delivery of container, 35,000 for collection of containers and 83,000 for shipping i.e. 133,000 vatu (NZ\$ 2,000) in total.
- 12 Rotary collects in Santo.
- 13 The aluminium factory and Aluminium Boats and Marine send their own containers sometimes – to Tool Ingots or Sims.
- 14 2 men are employed fulltime, could use more employees. Sometimes get a team of young people to help.

Meeting at: Chamber of Commerce
Port Vila, Vanuatu
Date: 27/9/99
Attending: Juliet Woodward
Toco Mara

- 1 The Chamber of Commerce looks after the business community interests. It is a semi-government department but it works on its own.
- 2 A key role is the dissemination of information. Also runs training e.g. small business management. Could organise seminars and forums for waste management training for the business community.
- 3 There is a Hotel and Resorts Association that has compulsory membership – could be a good target. There is also a Manufacturers Association.
- 4 Funds from the business licence goes to the Chamber of Commerce.
- 5 Have contact with the inter-island shipping agency, many container come from Fiji. Paul de Villiers from ESCAP does training for the freight forwarding industry.
- 6 Most metal is not collected any more – need more advertising, education and setting up of a scheme.
- 7 The Large Commerce Association covers supermarkets.
- 8 More consultation for the new environmental legislation is needed. Should use the Chamber of commerce to consult industry.
- 9 The Presbyterian Women's Mothers Unit is concerned about plastic bags wastes.
- 10 Sees the priority as training, education and awareness for community. Associations have enforcement powers with in the organisation that could be used for waste management
- 11 The Chamber has a council with representatives from all sectors of industry. – 15 members, 5 women, meet monthly.
- 12 Power is through lobbying government and influencing the commercial and industrial sector.
- 13 Kiwanis do a cleanup campaign once or twice per year.

Meeting at: Vanuatu Brewery
Port Vila, Vanuatu
Date: 28/9/99
Attending: Juliet Woodward
Murray Parsons

- 1 Produces Tusker, Vanuatu Bitter, Pripps, Wheat Beer, Wines, Spirits and Cascade soft drinks. Produce 0.5 million litres beer per year and bottle 70,000 litres wine and 18,000 litre spirits per year.
- 2 Have 24 staff
- 3 Broken glass is dumped – about 1 x 2m³ trailer per month. Also paper, packaging and plastic waste. They burn damaged cartons daily (20 cartons maximum).
- 4 Bottles are recycled – 92-94% are recovered. 3-5% are damaged and are rejected.
- 5 Bottles are from Australia and Sweden – 75-100,000 per year.
- 6 Containers costs Aus\$2,750 to Vanuatu and Aus\$1850 for return journey.
- 7 Would be willing to do recycling – Swedish are very keen on recycling.
- 8 Label pulp goes to landfill.
- 9 Sugar is from Australia in 25kg paper sacks – bags to landfill or burnt.
- 10 100 tonnes malted barley is used per year in 25 kg plastic sacks – this waste goes to pig farmers as spent mash (free).
- 11 Yeast to drain – 2,000 litres per month. Would like to use this as fruit fly bait byproduct.
- 12 Pallets are reused or used for wood.
- 13 CO₂ is the most expensive ingredient.
- 14 A new bottle costs 50 Vatu
- 15 Believes that cultural awareness is the biggest problem e.g. bins get vandalised, littering is a big problem.

Meeting at: Vanuatu Beverage Ltd
Port Vila, Vanuatu
Date: 26/9/99
Attending: Juliet Woodward
George Henry Engineer
Edwin Manager

- 1 Produce soft drinks (400 cases/month), fruit juice and cordial (4800 litres/month). Also whiskey and rum (3600 litres/month). Import canned and PET bottles of Schweppes (400-500 cases per month).
- 2 Damaged glass is dumped in a big hole on the site (40x30x4metres). Also old machinery is dumped. The hole is 20 years old and is about one third full.
- 3 Glass bottles are recycled about 20 times.
- 4 Buy 15 containers bottles per year - 540000 bottles per year.
- 5 35% bottles are lost.
- 6 Breakages are 2-3% in the factory.
- 7 Waste cartons are burnt once per week. Cartons are reused for outer island delivery. 22,500 cartons are bought per year.
- 8 Plastic crates are used now are reused.
- 9 Cans imported are 360,000 per year.
- 10 PET bottles imported are 60,000 per year.
- 11 Other plastic bottles (HDPE) are from Australia - 4 containers of 315ml bottles, 4 containers of 2 and 1 litre bottles.
- 12 140,000 HDPE 315ml bottles per year
- 13 30,000 HDPE 1 litre bottles per year
- 14 11,250 HDPE 2 litre bottles per year
- 15 Would be willing to segregate and deliver broken glass.
- 16 Could charge for HDPE bottles and collect them back.
- 17 Sugar is bought in 25kg paper sacks - these are burnt or reused.
- 18 Spirits bottles are reused - about ¼ are returned. 57,600 bottles are bought per year.

Meeting at: Unelco
Port Vila, Vanuatu
Date: 30/9/99
Attending: Juliet Woodward
François Py
Albert Williams

- 1 Electricity - there are two sites for production, Efate and Santo. Company has been operating for 30 years. Have about 130 staff.
- 2 Concession for 40 years of supplying water from February 1994.
- 3 Wastes - a contract exists with Mobil and Shell to send used oil to Fiji for burning.
- 4 papers go to landfills.
- 5 Waste Oil - twice a year one container is filled with 44 gallon drums of waste oil.
- 6 W.T.P. - 1 pump on the Tagabe River
six boreholes
= 18,000m³/day
- 7 Aquifer Reservoir - 60,000m³/day
- 8 Last year supplied 3,200,000m³/yr. In 1998 there were 4300 connections.
- 9 Treatment is chlorine (gas) only.
- 10 The water supply is very good - sometimes it has sediment or organics.
- 11 The waste is delivered to the landfill on Friday afternoon - approximately 5m³/week
- 12 Old cables are reused or stored.
- 13 Old iron tanks and galvanised pipe is stored as it is unknown what to do with it.
- 14 Unelco will support environmental initiatives.
- 15 Hospital WWTP - the hospital has a small budget. Two years ago the French embassy paid for an upgrade of the WWTP. There will be operations/maintenance contract for the WWTP at the hospital - one million Vatu/yr. The pumps have been changed and sand filters have been desludged.
- 16 There is a plan for an education programme next year regarding water treatment.

Meeting at: Mobil
Port Vila, Vanuatu
Date: 1/10/99
Attending: Juliet Woodward
Jacques Nioteau

- 1 32,000l of waste oil is produced each year.
- 2 Unelco and Mobil are cost sharing for the recycling of waste oil.
- 3 Unelco pays the shipping cost.
- 4 Mobil puts the oil in tanks and ships it to Lautoka, Fiji where it is burned with fuel or used in engines.
- 5 'Mobil Fiji' take the waste oil.
- 6 There is a problem in service stations that waste oil is mixed with gasoline, but in Unelco it is pure so it can be reused. There is a need to train all of the service stations not to mix it with gasoline. It has to be 100% oil - not detergent/gasoline in order to reuse it.
- 7 There is a ship every month to Australia. The cost is \$2,700 to Melbourne for one container.
- 8 New Oil sold per year = 60,000l.
- 9 Shell has 40% share of the market. Mobil has a 28% share of the market. Also BP.
- 10 Mobil train staff. They give them empty drums for collection of waste oil.
- 11 There is a need to start working with the government on waste oil collection from Government vehicles.
- 12 Mobil has introduced an environmental specialist - Glen Niovenmal.

Meeting at: Rainbow Gardens
Port Vila, Vanuatu
Date: 1/10/99
Attending: Juliet Woodward
Albert Williams
Cornelia Wylie

- 1 They are the biggest nursery and market gardens in Port Vila – do potted plants for commercial properties and restaurants and hotels, also do fresh cut flowers and herbs and vegetables.
- 2 Buy 20 tonnes potting mix and seed mix per 2-3 months.
Potting mix is 1560 Vatu/50 litre) Seed Mix is 1750 Vatu/50 litres and includes vermiculites and trace elements and is steam sterilised.
- 3 Have a 75 year lease on the land.
- 4 The Council shredder which they are using on their property is the wrong type for vegetation eg. Green leaves. It will do logs, trees and wood quite well. Needs to be mechanically loaded. It does not have a magnetic switch of – needs one.
- 5 During the last cyclone they processed 8 skips of waste and 1 skip of hard waste for the Council. They spent 60,000 Vatu (diesel is 91.4 vatu/litre) on the fuel to run the shredder and produced about 36m³ of compost.
- 6 Banana eaves and coconuts do not work in the grinder.
- 7 Can use 200 litres every 2-3 days (7 hour day) for the grinder only.
- 8 The grinder is fixed speed only – variable would be better. It is a TORO Progrind 900. The company is based in Auckland and has been no help with getting the grinder running properly.
- 9 They require a hand fed mulcher as well as the grinder.
- 10The local price of soil sold locally is about 2300 vatu/m³.
- 11They would like to see the Council bringing the market waste to them for composting.
- 12Need to have a formal arrangement with the Municipality to do the composting and mulching of

Meeting at: Port Vila Hospital
Port Vila, Vanuatu
Date: 24/9/99
Attending: Andrew Reeve
Viran Tovu
Gedian Romoleo Hospital Manager

- 1 There is a system in place and it seems to be working reasonably well
- 2 There is waste segregation and an incinerator.
- 3 Hospital needs a skip and a collection service for the general waste going to the dump – at the moment they use their own van and this is inefficient. Wastes tend to build up behind the incinerator. A designated collection area which can be kept clean is needed.
- 4 A system to use yellow bags for medical waste for incineration should be implemented to prevent the possibility of medical waste going to the landfill.