
GEF-PAS Project on Pacific POPs Release Reduction through Improved Management of Solid and Hazardous Wastes

Consultancy Report: Organic Waste and Waste Oil Strategy Enhancement

Prepared by Dr Bruce Graham, under contract to the Secretariat for the
Pacific Regional Environment Programme (SPREP), August 2011

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SUMMARY

This document provides a report on a consultancy carried out from February to May 2011 under contract to the Secretariat of the Pacific Regional Environment Programme (SPREP). The consultancy was one of a number administered by SPREP with the overall aim of developing the detailed design document for a project on *Pacific POPs Release Reduction through Improved Management of Solid and Hazardous Wastes* (the GEF-PAS project).

The work done under the consultancy involved the following:

- Collation and review of information relating to previous activities within the Pacific region on the management of organic wastes and waste oil reuse and disposal
- Visits to 4 Pacific Island countries to assess the current state of activities relevant to the subject areas, and to explore possible options for further work under the project
- Development of proposals for future activities, including indicative work plans and budgets
- Participation in a regional consultation workshop aimed at refining the proposals
- Preparation of detailed work plans and budgets for use in the project design document.

Section 2 of this report provides a review of the information obtained in relation to previous activities within the Pacific region. The information on organic wastes is broken down into the different 'management' components, including: policies, plans and strategies; regional, national and community-based projects; research studies; alternative technologies; education and awareness; guidance documents; laws and regulations; and the use of economic instruments. A much simpler breakdown was used for waste oil (previous studies and reports; past and current activities) because the amount of available information is much more limited.

Section 3 of the report covers information on current and proposed regional activities; primarily the JICA waste management programme and the AFD regional solid waste initiative. The AFD project is considered as a source of co-finance for the GEF-PAS project.

Information obtained during visits to the Cook Islands, Fiji, Samoa and Papua New Guinea is given in Section 4, along with a summary of the responses to a questionnaire on waste oil that was sent to all other countries.

A gap analysis of all of the above information is presented in section 5 of the report, along with an indication of the possible options for addressing some of those gaps through the GEF-PAS project.

Finally, an outline of each of the activities proposed for inclusion in the project is presented in section 6, and the detailed work plans and budgets are given in section 7. It should be noted that these proposals are limited to the specific elements that had to be addressed under this consultancy. Other elements of the GEF-PAS Project Design Document have been prepared by other consultants.

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Consultancy Report: Organic Waste and Waste Oil Strategy Enhancement

1. Introduction

1.1 Purpose of the Report

This document provides a report on a consultancy carried out from February to May 2011 under contract to the Secretariat of the Pacific Regional Environment Programme (SPREP). The consultancy was one of a number administered by SPREP with the overall aim of developing the detailed design document for a project on *Pacific POPs Release Reduction through Improved Management of Solid and Hazardous Wastes* (herein referred to as the GEF-PAS project).

A copy of the TOR for the consultancy is given in Appendix 1. The work involved:

- Collation and review of information relating to previous activities within the Pacific region on the management of organic wastes and waste oil reuse and disposal
- Visits to 4 Pacific Island countries to assess the current state of activities relevant to the subject areas, and to explore possible options for further work under the project
- Development of proposals for future activities, including indicative work plans and budgets
- Participation in a regional consultation workshop aimed at refining the proposals
- Preparation of detailed work plans and budgets for use in the project design document.

1.2 Background

The GEF-PAS project is to be funded by the Global Environment Facility (GEF), as part of the Pacific Alliance for Sustainability (GEF-PAS) programme. There are two major co-finance partners; the French Development Agency (AFD) and the Food and Agriculture Organisation (FAO), and the Implementing Agency will be the United Nations Environment Programme (UNEP).

The overall objective of the GEF-PAS project is: *To reduce POPs releases in the Pacific Island states through the introduction of integrated whole-system approaches to the environmentally sound management of solid and hazardous wastes.* The project has the following eight components, as listed in the GEF Project Information document:

1. Development of national and regional uPOPs¹ prevention and management strategies
2. Training and awareness raising in solid and hazardous waste management
3. Enhanced, post-NIP² inventory, stockpile management and safe disposal strategy for unwanted pesticides (including POPs) and school laboratory chemicals
4. Waste oil export and reuse in Polynesia and Melanesia
5. National technical assistance for country-specific post-NIP activities
6. Legislation enforcement and promotion of low risk alternatives in agriculture and wood treatment, in Pacific Island Countries with significant reliance on pesticides
7. Impact monitoring and evaluation, lessons learned, knowledge management, project planning and administration, and future project identification

¹ The term uPOPs is used throughout the project documentation to refer to those Persistent Organic Pollutants known to be formed and released unintentionally from anthropogenic sources, as listed in Annex C of the Stockholm Convention.

² NIP = National Implementation Plan for the Stockholm Convention

8. Project management

The work done under the consultancy relates mainly to components 2 and 4 of the project.

Component 2 of the project will involve three elements: a vocational training programme on waste management, education and awareness activities, and a series of pilot projects. The work on organic wastes will be done under the pilot projects element, although the education and awareness activities will also include aspects of organic waste management. There is also a connection to the strategy development work proposed for component 1.

Component 4 of the project is based around establishing waste oil collection, storage and disposal systems for each Pacific Island Country. In most cases the oil will be exported for reuse in suitable high-temperature facilities, such as a steel mill in Fiji. Assistance will also be given for the development of product stewardship systems, which could be based on either voluntary, legislative or economic approaches. A significant part of the co-finance for this component is to come through its integration with a project funded by AFD; the Regional Waste Initiative (see section 3 of this report).

1.3 Work Programme

Work under the consultancy started in early February 2011 and ran through to the end of July (although most inputs were completed by mid-May). The breakdown of activities was generally as follows:

- 1 – 26 February: project planning, liaison with SPREP, UNEP and other project design consultants, collection of background information, organisation of country visits
- 14 - 17 February: visit to Rarotonga, Cook Islands
- 27 February – 20 March: visits to Fiji, Samoa and Papua New Guinea (1 week each)
- 21 March – 9 April: preparation of draft project documents, document distribution and preparations for the regional workshop
- 10 – 15 April: regional consultation workshop, Nadi, Fiji
- 16 April – 8 May: preparation and distribution of revised project documents
- 15 May – 31 July: assistance as required with review of the draft Project Design Document and aspects of country participation and co-finance commitments.

The total time input to the project was equivalent to 12 weeks' full-time effort.

1.4 Report Content

Section 2 of this report provides a review of the information obtained in relation to previous activities within the Pacific region on the management of organic wastes and waste oil reuse and disposal, while section 3 covers information on current and proposed regional activities. Section 4 contains reports on the four country visits along with a summary of the responses to a questionnaire on waste oil, which was sent to all other countries.

A gap analysis of all of the above information is presented in section 5 of the report, along with an indication of the possible options for addressing some of those gaps through the GEF-PAS project. An outline of each of the activities proposed for inclusion in the project is presented in section 6, and the detailed work plans and budgets are given in section 7. It should be noted that these proposals are limited to those specific elements that had to be addressed under this consultancy. Other elements of the GEF-PAS Project Design Document have been prepared by other consultants.

2. Summary of Past Activities

This section provides a summary of past activities in the region in relation to the two main subject areas: organic waste management and waste oil reuse and disposal. A list of references quoted within the text is given at the end of the section.

2.1 Organic Waste Management

2.1.1 Policies, Plans and Strategies

The guiding documents for waste management in the Pacific are the *Solid Waste Management Strategy for the Pacific Region*¹, which was adopted by SPREP member countries in 2005, and then updated 5 years later with the *Pacific Regional Solid Waste Management Strategy 2010-2015*². As pointed out in both of these documents, much of the solid waste produced in Pacific Island countries has high proportions of organic matter or green wastes, and much of this is disposed unnecessarily to landfill.

The potential benefits of alternative waste treatment processes such as composting and mulching were pointed out in the 2005 Strategy document and it was noted that:

Various forms of composting have been traditional to Pacific Island societies, where historically the only waste produced was biodegradable. Household composting is being widely promoted throughout the region with varying degrees of success. However much work remains to be done to establish this as the preferred approach for organic waste management in the Pacific. Other options such as worm farming have also been developed.

Section 4.4 of the 2005 Strategy document contained a proposed *Activity D5: Promotion of Community Composting Activities*. However, this proposal was not carried over into the more detailed list of activities given in Appendix 1 of the document, and it does not appear to have been given any further consideration – for example, it is not listed in the Progress Review section (Table 5) of the 2010-2015 Strategy document. The only significant coverage of composting in the latter document is in the listing of ‘4R Activities’ given in Table 9, which indicates that composting activities have been undertaken in the Cook Islands, Fiji, Palau, RMI, Samoa, Tokelau, Tonga and Tuvalu.

Activity D1 of the 2005 Strategy covered the development of national waste minimisation strategies, and it was noted in the 2010-2015 document that this work was either started or on-going in FSM, Fiji, Palau and Tonga. Composting is a key waste minimisation option for organic wastes.

2.1.2 National Implementation Plans for the Stockholm Convention.

Thirteen of the 14 independent Pacific Island states are Parties to the Stockholm Convention on Persistent Organic Pollutants, with the only exception being Palau. Six of the countries have submitted their National Implementation Plans (NIPs) to the Convention Secretariat and the NIPs for a further five countries are in an advanced draft state.

The coverage given to waste burning and composting in each of the published or draft NIPs is summarized in Table 2.1. The burning of household rubbish was noted as a significant source of releases of unintentional POPs in nearly all of the countries. Household rubbish burning may include the burning of green (garden) wastes. However, most NIPs also noted green waste burning as a separate, but related, issue. This activity can also include the burning of bush and scrub for the purposes of land clearing.

The action plans given in all but two of the NIPs include specific proposals for addressing waste burning, and five of them made specific reference to the promotion of composting as an alternative to burning.

Table 2.1: Coverage of Waste Burning and Composting in Country NIPs

Country	Burning Identified as an Issue		Specific Actions or Strategies	
	Rubbish	Green Waste	Discourage Burning	Promote Composting
Cook Is	Yes	Yes	Yes	Yes
Fiji	Yes	Yes	Yes	No
FSM	Yes	No	Yes	No
Kiribati	Yes	Yes	No	No
RMI	Yes	No	Yes	No
Nauru	Yes	Yes	No	No
Niue	Yes	Yes	Yes	Yes
Palau	-	-	-	-
PNG	Yes	Yes	Yes	No
Samoa	Yes	Yes	Yes	Yes
Solomon Is	-	-	-	-
Tonga	Yes	Yes	Yes	Yes
Tuvalu	Yes	Yes	Yes	Yes
Vanuatu	Yes	Yes	-	-

(Note: The entries for Vanuatu are based on a background document³).

Most of the action plans in the NIPs also include proposals for the promotion of best available techniques and best environmental practices (BAT/BEP) for reducing the releases of unintentional POPs, as required under Article 5 of the Convention. This would include the use of mulching or composting as an alternative to the burning of organic wastes⁴.

2.1.3 Waste Characterisation Studies

Waste characterisation studies usually provide estimates of the proportions of different types of materials present in municipal or domestic wastes, and the total quantities disposed to landfills. The available data for Pacific Island countries was summarised in Table 3 of the 2010-2015 Strategy document. The most extensive set of studies was done in 1999 under an EU/SPREP project on Solid Waste Education and Awareness in Pacific Island Countries⁵, which provided waste composition data for selected urban areas in Fiji, Kiribati, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. More recent data is also available for the Cook Islands, Fiji, Kiribati, Niue, Palau, Samoa, and Vanuatu (see Table 3 of the 2010-2015 Strategy document), while some historical data is given in a 1996 WHO publication⁶.

The key point arising out of the waste characterisation studies is the high proportion of potentially biodegradable materials present in the wastes. The 1999 studies were all done using a consistent methodology and indicated a range of 52 to 71% and an average figure of 58%. The methodologies used in the more recent studies were less consistent and showed a range of between 8 and 75%.

2.1.4 Regional, National and Community-Based Projects on Organic Waste Management

The most significant regional, national and community-based projects on organic waste management are summarised below. As indicated, most of these were implemented about 5 to 15 years ago. No information has been found to indicate similar projects started more recently, although some of the composting activities noted have continued to operate beyond the nominal end of the projects.

GEF/UNEP/SPREP International Waters Programme, 2000 to 2006

The Strategic Action Programme for the International Waters of the Pacific Small Island Developing States⁷ was an initiative involving 14 Pacific Island Countries. It was implemented by UNDP and executed by SPREP. The project was targeted at promoting actions at the community level, through pilot projects in each country. The project also provided assistance for the development of national waste strategies, and production of the Rubbish is a Resource toolkit (see section 2.1.8).

The topics for the pilot projects were selected by each country from the following list: improved waste management, sanitation, fresh water quality, sustainable fisheries, or marine protected areas. The waste focal area was targeted in 8 countries, but the following countries were the only ones with specific activities related to organic wastes.

Kiribati

The Kiribati pilot project focused on solid waste management in the community of Bikenibeu West, on the island of Tarawa. The project worked to implement and demonstrate a household waste separation scheme, with (i) biodegradable organic waste being used as compost for food crops (eg. in 'banana circles'), (ii) recycling of aluminium cans, glass bottles and used batteries, and (iii) the remaining inorganic waste being placed in 'Green Bags' provided by the project, for collection and disposal at a newly created landfill.

Palau

The Palau project activities included community-level compost training; establishment of a compost demonstration site, and social marketing to encourage composting, including separation of waste.

Marshall Islands

The RMI project focused on solid waste management in the village of Jenrok on the island of Majuro. The project activities included implementation of a solid waste separation scheme, with biodegradable organic waste being used to make compost, aluminium cans, glass bottles and batteries being sent for recycling, and the remaining inorganic waste being placed in skips for collection and disposal at a rubbish dump.

Tonga

The project activities were based on the village of Nukuhetulu and included compost training workshops, development of household compost and home gardening demonstration sites and a village organic farming demonstration plot and plant nursery.

Tuvalu Waste Management Programmes, 2000 – 2005

There were two waste management projects over this period in Tuvalu; the AusAID-funded Solid Waste Project that ran from 2000 to 2002⁸ and an ADB-funded project on Effective Solid Waste Management and Recycling, in 2004 and 2005⁹.

The AusAID programme included a pilot project on composting, which was conducted to determine:

- the viability and acceptability of composting by the community, and
- the viability of composting as an appropriate means of disposing of green waste.

The original plan was to have a pilot composting project in 50 households but it was later extended to an island-wide household waste collection programme. The activities included an education program, the procurement of a shredder and the construction of compost facilities. The work was also linked to concurrent education and awareness activities under another project, which promoted the use of the compost in home gardens (see section 2.1.8).

The AusAID project was considered to be quite successful in developing a composting programme on Funafuti, and the demand for compost was found to still be high when the ADB project started in 2004. This latter project also had a composting component, the main elements of which included

improvements to the green waste collection system, maintenance of the shredding equipment provided under the AusAID project, staff training in proper composting procedures, and an assessment of the economics of the operation.

Kiribati Sanitation, Public Health and Environment Improvement Project (SAPHE), 2001-05

The SAPHE project had a strong focus on sanitation issues, but also included the following aspects related to solid waste management and composting¹⁰:

- Improvements to the waste management system on Tarawa, including the design of four fenced solid waste landfills and provision of solid waste facilities and equipment including shredders, composting operations, and a hospital incinerator, and assessment of the need to make provision at landfill sites for composting and recycling areas;
- Preparation of plans for Councils to promote volume reduction of solid wastes, including a public relations program to promote composting of organic waste;
- Review of the overall operation of the solid waste management service, including its effectiveness and cost-efficiency, and
- Preparation of a manual on Solid Waste Management operations including the overall operations, waste recycling, and collection and disposal site operations.

It appears that some of these outcomes were achieved by the project but others were not. In particular, a recent review¹¹ carried out under the 2009 NZAID Sustainable Towns project found that:

- *Disposal practices have improved following remedial works to the Betio landfill and construction of two new landfills under the SAPHE project;*
- *Small scale home composting of garden waste is practised by some households;*
- *There are currently no processing/treatment facilities for rubbish, particularly green waste, even though the Councils have a mulcher provided by donor funding.*

Tonga Solid Waste Management Project, 2004 – 2010

This AusAID project established an effective solid waste management system on Tongatapu. It entailed building and operating a new solid waste facility, developing a waste collection and transfer system, and establishing recycling businesses and public awareness campaigns, all with community involvement. The project also helped the Tonga Government to establish a public enterprise known as Waste Authority Limited (WAL) to run waste management on a cost recovery basis through public fees and charges.

The project provided shredding equipment to the Forestry Department and to an NGO for use in composting. According to a leaflet published by WAL¹², all green waste is now directed to a private facility operated by Ma'ui'ui Organics for conversion into compost. The compost is sold for use by home gardeners and commercial growers.

Sup Sup Gaden Project, Solomon Islands

The Sup Sup Gaden project was started in 1986 by the Honiara Town Council with a focus on home vegetable gardening^{6,10}. The scope of the activities was broadened in 1989 to incorporate other relevant issues such as the linkages between personal hygiene and environmental cleanliness, nutrition, proper yard maintenance, and home composting of organic wastes. As the project evolved over the years, a demonstration gardening and distribution centre was established to provide education on the techniques of vegetable gardening, composting and food preparation. The fundamental message of Sup Sup Gaden was to recycle household organic waste into productive food gardens.

More recently¹³, the Honiara Town Council has provided a collection service for organic wastes produced at the city's main open market and delivers this to the Kustam Gaden Association for processing. The wastes are shredded and placed inside a cylindrical frame made out of a reinforcing

bar and a wire mesh. The frame and its contents are placed longitudinally on the ground and manually rotated each day, with water being added as required. Material is removed from the frames after about 30 days and placed in small piles to cure for an additional 30 days. The finished compost is either sold to farmers for about US\$3 per 20-litre bag, or taken to a demonstration garden managed by Kustam Gaden, where a variety of vegetables are grown.

Coral Gardens/Wai Bulabula Restoration Project, Fiji

The Coral Gardens Initiative and the Wai Bulabula (Living Waters) project were two separate but linked community-based programmes which were started in 2000 in Cuvu, a coastal district made up of eight villages on the south-western side of Viti Levu¹⁰. The projects were a collaborative effort between the local communities, NGOs and the Shangri La resort, and were coordinated by the Foundation for the Peoples of the South Pacific.

The Coral Gardens Initiative was focused on reef restoration and coral protection, while the Wai Bulabula project aimed to reduce loadings of liquid and solid wastes on the marine and freshwater environment. Both programs worked together to empower local communities to reverse the decline of coral reefs and near-shore waters, and to increase benefits to the community, such as food and income from fish sales and tourism.

The Wai Bulabula project included demonstration programmes for composting and vermiculture, and the promotion of waste minimisation and composting in each of the villages. The partnership with the Shangri La also led to a range of activities being developed at the resort, including mulching of drift algae and leaves and twigs from the garden, and weekly harvesting of Water Hyacinth for use in composting.

Japan's Solid Waste Management Programme, 2000 onwards

The Japanese programme on solid waste management in the Pacific was started in 2000 and has continued in various forms through to the present¹⁴ and beyond (the 2010-2015 programme is summarised in section 3). The main elements of the programme have been delivered through the Japan International Cooperation Agency (JICA) in a collaborative effort with SPREP. In addition some of the work has been done using the Japan Overseas Corp of Volunteers (JOCV) programme, and some has been done bilaterally through the Ministry of Foreign Affairs.

The programme has supported intensive training courses in waste management, demonstration projects (including composting), technical assistance projects and equipment funding, improvement projects at existing landfills, and the development of guidelines for landfill design, operation and management. JICA also provided significant support for the development of the 2005 and 2010-2015 waste strategy documents discussed in section 2.1.1.

Specific activities related to organic waste management have included waste characterisation studies in several villages throughout the region, a community-based composting project in Samoa, and composting demonstrations and the provision of compost bins in Lautoka and Nadi, Fiji. In addition, the regional training courses have included sessions on composting, and an information booklet on composting is currently in preparation, based on the work done in Fiji.

FAO and SPC Composting Programmes

The Food and Agriculture Organisation and the Secretariat of the Pacific Community are the lead agencies for agricultural development in the Pacific region, and both organisations have carried out significant activities in relation to composting. For example, FAO have previously supported composting projects with a particular focus on crop production in the atoll environment¹⁵. Similarly, the SPC project on Development of Sustainable Agriculture in the Pacific ((2003 – 2010) included composting activities in most of the 16 participating countries and territories¹⁶.

The FAO and SPC work has a primary focus on improving agricultural productivity, rather than on solid waste management. However it should be kept in mind when considering flow-on aspects of any composting projects, such as the potential markets for compost use.

2.1.5 Organic Waste Management Studies by Tertiary Institutions

Pacific Centre for Environment and Sustainable Development (PACE-SD), USP, Fiji

USP has carried out a number of waste-related studies in the past under the auspices of PACE-SD, although this work appears to have lapsed in the last few years with the departure of particular staff members³. Previous activities relating to organic waste management included composting of organic wastes collected on the Suva campus as part of the USP Waste-Wise Project¹⁷, composting of organic wastes collected from the Suva market¹⁷ and a pilot project on composting at two secondary schools in Suva¹⁸. The composting work included the development of a simple rotating drum system, which was aimed at facilitating composting at the household level, where space may be limited.

Western Pacific Tropical Research Centre, University of Guam

The main focus of the organic waste programme at WPTRC is on developing improved methods of utilising agricultural organic wastes for soil and crop benefits while minimising environmental degradation¹⁹. This includes recycling programmes at their research stations to produce compost for land application to agricultural and forest land.

A summary of the composting research work is given in a paper by Golabi et al²⁰, and Golabi has also recently co-authored a proposal for large-scale composting of green waste on Guam²¹.

College of Tropical Agriculture and Human Resources (CTAHR), University of Hawaii

The CTAHR is engaged in a range of activities to promote the understanding and practice of sustainable agriculture in Hawaii, and is also involved in extension activities in other parts of the Pacific region, especially the US territories, and ex-territories²². Two relevant aspects of the CTAHR work are composting studies involving animal manure, and the production and use of Compost Tea, which is a liquid fertiliser made from compost. (nb. staff at the Apia campus of USP have also done research on compost tea²³). The Centre has also published a simple guide for home composting²⁴.

Southwest States & Pacific Islands Regional Water Program

This programme is a partnership between the US Department of Agriculture, the National Institute of Food and Agriculture, and Land Grant Colleges and Universities²⁵. One of the activities of interest under this programme is animal manure and waste management, which has included a significant amount of work on the management of piggery wastes through dry litter composting systems.

The work in the Pacific Islands is delivered in conjunction with the Region 9 Office of the US Environmental Protection Agency²⁶. Region 9 covers the Southwest States of the USA and the Pacific Island territories and ex-territories.

2.1.6 Anaerobic Digestion

Anaerobic digestion has been used extensively for the treatment of human and animal wastes, in both developed and developing countries²⁷. It has also been used for the treatment of industrial wastes, especially from the food-related industries. However, its application to the organic fraction of municipal solid wastes is much less common - other than through the anaerobic decomposition processes that occur within landfills. The following are the only examples identified for the direct use of anaerobic digestion systems in the Pacific Islands.

³ However, the recent appointment of Dr Melchior Matakai may see a revival of the work in the waste area.

Montfort Boys' Town, Fiji

Montfort Boys' Town is a residential vocational training facility for disadvantaged children, which had traditionally raised money by fish-farming. In the mid-1990s, the centre was chosen by Professor George Chan of the United Nations University, Tokyo, for use as a development site for demonstrating the concept of integrated bio-systems²⁸.

The Boys' Town operation processes unwanted brewery wastes into a substrate for use in mushroom growing. The spent substrate is used as feed for the production of pigs and chickens, and the wastes from these activities are then fed to a digester for the production of methane. The gas is used in an electricity generator and to provide steam for the mushroom operation, while the liquid effluent from the digester is used as a fertiliser for algae production in a series of ponds. The algae are then used for making compost, for use in growing fruit and vegetables, and as fish feed.

Samoa Pilot Project on Biogas

In 2010 the Environment and Development Division of the UN Economic and Social Commission for Asia and the Pacific assisted the Youth With A Mission organisation in Samoa to build a model biogas digester in the village of Falelauniu²⁹. This is the first step in a project to provide biogas technology as an affordable renewable energy source for Samoa households. The project will not only generate income for poor households but also reduce environmental pollution caused by animal, human and kitchen wastes.

The pilot project launch and inauguration of the facility was held on 24 November 2010, and included a training workshop on biogas technology and its benefits. The project has benefited 50 households directly, it employs six workers, and more than 200 people have been trained in the relevant aspects of organic waste management.

Waste Digester Trials, Samoa, 2001- 2004

This project was set up by an international NGO, Sustainable Project Management³⁰, with funding from NZAID. It involved the construction of an in-ground covered reactor adjacent to the Tafiagata landfill, which was to be used for digesting some of the incoming organic wastes to produce biogas. The ultimate aim was to produce bottled methane for sale as a substitute for bottled LPG.

The digester was built and commissioned in 2003. However, some significant difficulties were encountered in getting it to work effectively, and the volumes of gas produced were well below expectations. Hence the project was never taken any further³¹.

2.1.7 Waste to Energy

The most significant examples of operational waste to energy plants in the Pacific are the power boilers used in sugar mills, which burn sugar cane waste (bagasse) as a primary fuel. Some copra plants and palm oil mills also use their plant wastes as a source of process energy.

There have been a number of proposals in recent years for the construction of waste to energy plants fired on municipal solid wastes, either solely or in combination with other fuels such as wood wastes. These proposals appear to have been prompted by a combination of the concerns over solid waste disposal options and rising fuel prices. The most recent of these proposals are noted below.

American Samoa

The American Samoa Power Authority (ASPA) received a technical assistance grant from the US Department of the Interior to conduct an extensive waste composition study and an energy from waste feasibility study in 2009³². These studies were completed in 2010 and ASPA is taking steps to permit and procure a 2.0 Megawatt, modular energy from waste plant. The 2 MW plant is based on an estimated daily production rate of 62 (US) tons of municipal solid wastes, waste oil and tyres. The energy produced would account for about 7% of the Territory's total energy generation capacity.

It was stated in an item in the Samoa News on 11 March 2011³³, that the tender process was “currently underway”.

Fiji

In August 2009, the Fiji Electricity Authority entered into an agreement with a local company, Iviti Renewable Disenergy Power Plant Company, for the supply of electricity from a new waste to energy plant which is to be built near Sigatoka on the island of Viti Levu³⁴. The plant is described as being based on a pyrolysis system, and can be fired on a wide range of wastes including biomass, waste oil, construction and demolition timber, sewage sludge and green waste. The capacity of the plant is expected to be about 10 MW and the capital cost is around US\$150million. The construction project was officially launched on 8 March 2011³⁵.

Other

Various proposals for waste incinerators have been under consideration for the last 15 to 20 years in the Marshall Islands, and it appears that these have now evolved into proposals for waste to energy systems³⁶. To date, none of these proposals have progressed beyond the conceptual stage. Similar proposals are also being considered for other parts of Micronesia, including Saipan³⁷.

2.1.8 Education and Awareness

There have been numerous education and awareness programmes in the Pacific region over the last 20 years, some organised regionally but most have been done at a national level. Regrettably many of the national activities were unable to be reviewed due to a lack of published reports. The following notes cover only those projects with a significant organic waste component.

Solid Waste Education and Awareness, 1999-2001

This project was funded by the EU and delivered through SPREP³⁸. The regional components of the project included the waste characterisation studies noted in section 2.1.3, waste awareness surveys in Suva, Apia and South Tarawa³⁹, and the preparation and distribution of educational materials, such as posters, radio spots, a video and a comic book. Funding for national activities (~ US\$7,500 each) was provided to eight countries, for the design and implementation of Solid Waste Education and Awareness Projects and/or Solid Waste Management and Minimisation Projects.

Activities specifically related to organic waste management, mainly composting, were carried out in Kiribati, Samoa, Tuvalu and Vanuatu. The nature and scope of some of these activities is illustrated by the following summary of the Tuvalu project, which is taken from a 2002 regional review¹⁰.

The SWEAP project (approx. \$US7,500) focused on public education regarding waste management and held community training workshops on source separation and the production and management of compost. Brochures, posters and newsletters were produced in the Tuvaluan language and the expatriate advisers from the WMP attended meetings and workshops intermittently. The Tuvaluan Association of NGOs (TANGO) was also invited by the project to talk to various groups through their Kitchen and Water Catchment Improvement Project (which includes a component on diversifying food sources through enhancement of kitchen gardens) and other awareness raising activities. Project counterparts spoke at various TANGO activities and technical advice has been provided to TANGO members on composting processes.

KEEP, Kiribati, 1996 – 2002

The Kiribati Environmental Education Programme (KEEP) was implemented by FSP-Kiribati with funding by AusAID, British DFID, NZODA and SPREP¹⁰. The activities carried out under the project included waste awareness and education, utilisation of bio-degradables through composting, trials of composting toilets, and the Bikenibeu Pilot Project on Solid Waste Management.

FSP-Kiribati conducted regular public workshops on waste management and recycling, and they produced radio programs on environmental and waste management issues. Homes were also visited to promote the reuse of glass bottles, and composting of paper and organic wastes for use in the gardens. An organic demonstration garden was also established in the FSP office and was used for seed trials, workshops, school visits and work experience. FSP supplied government departments and communities with seeds and seedlings adapted to atoll conditions.

Rubbish is a Resource Toolkit, 2005

The Rubbish is a Resource Kit was produced by SPREP with funding from the International Waters Project, and consisted of an interactive DVD and a booklet of information on a wide range of aspects of waste minimisation and other background material. It had a particular focus on the work done in Kiribati, and included specific instructions for composting using the Banana Circles method. A pdf version of the Toolkit is available on the SPREP website⁴⁰.

Pacific Year of Action Against Waste, 2005

The 2005 Pacific Year of Action Against Waste was a SPREP initiative that aimed to promote and strengthen activities related to solid waste management throughout the region⁴¹. At a regional level the campaign was linked to the work on the Regional Waste Strategy document noted in section 2.1.1, and the production of the Rubbish is a Resource Toolkit. Support was also provided for national awareness campaigns although it is difficult to find any detailed reports on these activities.

A follow-up Year of Waste is currently being planned for 2012.

2.1.9 Guidance Documents

There are numerous guidance documents available throughout the world on aspects of organic waste management. However, the following are of specific interest because of their focus on Pacific Island countries or developing countries generally.

The UNEP *Directory of Environmentally Sound Technologies for the Integrated Management of Solid, Liquid, and Hazardous Waste for Small Island Developing States (SIDS) in the Pacific Region*⁴² provides a very detailed analysis of the requirements for different levels of composting processes, from home-based to national programmes.

The FAO publication *On-Farm Composting Methods*⁴³ provides an extensive coverage of the principles and practices of composting including specific methods for small and large scale systems, and an additional section on vermicomposting. As indicated by the title, the primary focus is on agricultural applications. However most of the information provided would be equally as applicable to home-based systems or composting at a village or municipal scale.

There are several other relatively simple guides that have been referred to earlier in this review; for example in the report on composting in Fiji schools¹⁸, a leaflet produced by the University of Hawaii²⁴, and the Rubbish is a Resource Toolkit⁴⁰. Composting guides are also available on the web site of some Pacific government agencies; for example the Guam Solid Waste Management Division⁴⁴.

2.1.10 Laws and Regulations

According to a summary given in the 2010-2015 Regional Waste Strategy² there are four Pacific Island countries that have enacted specific waste management legislation, and several others have regulations relating to specific waste issues such as littering, and the provision of waste disposal services. None of these have any detailed provisions for the management of organic wastes. However, some do provide a framework for this; for example Tonga's Waste Management Act 2005 tasks the Waste Management Authority with:

the promotion of recycling and the implementation of measures to minimise wastes having particular adverse implications for human health and the environment;

Similarly, Samoa's Waste Management Act 2010 tasks the relevant Ministry with:

promoting recycling, and implementing measures to minimise wastes having particular adverse implications for human health and the environment;

2.1.11 Economic Instruments

A recent report by SPREP provides useful information on the possible applications of economic instruments to solid waste management in the Pacific⁴⁵. The options noted include the use of waste generator levies, waste disposal fees, and more general environmental levies. Some countries already have legislation in place for the use of these instruments².

2.2 Oil Reuse and Disposal

The disposal of waste lubricating oil has long been recognised as a problem in the Pacific Islands region. Most of the wastes are produced through routine changes of the engine oil in vehicles, boats and electricity generator engines, with power stations being the most significant producer in many Pacific countries. Another related waste is the ships' slops and oil separator wastes produced at ports and oil terminals. The notes below provide a brief summary of previous studies, reports and other relevant matters in relation to these wastes.

2.2.1 Previous Studies and Reports

A 1994 survey of 12 Pacific Island Countries found that the total volume of oil consumed annually in the region was about 21 million litres, and it was expected that about half of this (10.5 million litres) would be discarded as waste oil⁴⁶. Significant stockpiles of waste oil were stored in some of the countries and most did not have any viable disposal options. The survey was carried out for the Forum Secretariat, who subsequently negotiated an agreement in principle with some of the major oil suppliers for the development of an oil recovery programme. However, this only ever operated on an erratic basis, and effectively collapsed with the changes in petroleum supply arrangements that have occurred in the region over about the last 5 years.

The problems with waste oil were also noted in the Phase I report for the AusAID/SPREP POPs in PIC Project⁴⁷. The project identified a total stockpile in excess of 200,000 litres across 13 of the Pacific Island countries (PNG was not included) and also noted the use of unacceptable disposal procedures, such as open-burning. Appendix C8 of the report gives some fairly general guidelines for waste oil management at power stations.

The plans for the International Waters Project (see 2.1.4) included a sub-regional waste oil study⁷. However, this component fitted poorly with the rest of the project and the study was not completed. Some preliminary research was carried out in 2002 to consider a waste oil recycling facility for Micronesia, but the research did not progress very far.

The waste oil situation⁴⁸ was also assessed in the feasibility study⁴⁸ for the AFD Regional Initiative for Solid Waste Management, which is described in section 3 of this report.

2.2.2 Waste Oil Disposal and Reuse Activities

Some Pacific Island countries have been successfully exporting their waste oil for reuse or disposal; for example the Cook Islands, French Polynesia and Niue. However, others, such as Kiribati have only been able to do so on an occasional basis, and have had problems with, for example, shipments being rejected because of sub-standard drums. The current situation regarding waste oil exports and the existing in-country stockpiles will be summarised in section 6.2 of this report.

The only oil recycling facility in the region appears to be in Guam⁴⁹. The Guam Refinery and Environmental Services Company accepts used oil from individuals, businesses and other local

producers. Since its inception in 1993, the company estimates that it has recycled a little more than three million gallons of oil. The process involves pre-treatment to remove water, followed by distillation, which produces a naphtha product and gas oil. These are further processed and blended with other feedstock to produce a diesel-type product.

An oil recycling plant was also established in Samoa in 1993⁵⁰. The plant took in oil from local producers and also imported it from nearby islands such as American Samoa. The treatment process involved drying, acid neutralisation and filtration, followed by blending with additives to produce a recycled oil product. Unfortunately, the plant was shut down after several years due to problems with import/export duties and a lack of consumer demand for the finished product

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3 Current and Future Work Programmes

The two programmes described below have significant components related to the management of organic wastes and one of them also has a significant component on used oil. The proposed project activities presented in section 5 of this report have been designed to ensure an appropriate level of integration with these projects and to avoid any duplication of effort. In addition, the AFD project noted in 3.2 is considered as a source of co-finance for the GEFPAS project.

3.1 JICA Waste Management Programme, 2011 - 2015

The Japanese Technical Cooperation Project for Promotion of Regional Initiative on Solid Waste Management (J-PRISM) is a 5 year project estimated at 800 million Yen (approximately US\$10 million) with the goal of enhancing sustainable management of solid waste in the Pacific Region. The project will involve eleven of the Pacific Island countries: Fiji, FSM, Kiribati, RMI, Palau, PNG, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. It will be delivered through a combination of bilateral and regional activities, with the remaining Pacific Island countries being invited to participate in the regional activities when appropriate.

The overall purpose of the project is to strengthen the human and institutional capacity base for sustainable solid waste management, through implementation of the Pacific Regional Solid Waste Management Strategy (2010-2015). The project activities will be developed to reflect the specific needs of each project member country, and are expected to range across most aspects of integrated solid waste management (comprising reduce, reuse, recycle, waste collection, and disposal), awareness raising, capacity development, and policy development. The project officially began in February 2011 with the establishment of the Project Office in SPREP, and project activities have already been started in several countries.

The indicative work plans for the project include a specific proposal for a composting project in the Marshall Islands. However, the details of work to be done in most other countries are either still under discussion or will be developed as the project progresses.

3.2 The AFD/SPREP Regional Solid Waste Initiative

This is a 4-year, 1 million Euro project, which is funded by the French Development Agency, and will be implemented by SPREP. It has the goal of improving the management of solid waste in the region by enhancing the Pacific Island Countries technical capacity to manage waste. There will be three project components as follows:

- i. the development and delivery of a regional technical/vocational training course in solid waste management,
- ii. the development of a regional waste oil export and reuse programme, and
- iii. funding for country-specific waste management projects.

The project delivery will be led by a Technical Assistant position which is to be based at SPREP, and the project is expected to get under way in the second half of 2011.

(Note: the AFD waste oil work listed under item ii was used as the starting point for the proposed work programme presented in section 6.2 of this report. The information presented in section 6.2 gives a more detailed breakdown of the proposed work activities starting from the original framework of the AFD project documentation).

4. Country Visits and Questionnaires

This section of the report provides notes taken during visits to four countries, Cook Islands, Fiji, Samoa and Papua New Guinea. In addition, those countries not included in the visits were sent a questionnaire relating to waste oil and the responses to this are summarised in section 4.5. The topics covered during the country visits extended across a wider range of subject matters other than just organic waste management and waste oil. This is because the visits were also intended to support the work of two other consultants, Mark Vaughan and Melanie Ashton, who were responsible for developing work plans for other components of the GEPAS project.

4.1 Cook Islands (Rarotonga)

Visit dates: 14 – 18 February 2011.

Tania TeMata, Deputy Director, National Environment Service (NES)

Composting

Tania questioned the need for further compost demonstration activities, given the amount of work that has already been done at a regional level. However, she did acknowledge the need to provide support for the development of larger-scale composting operations. There are no such operations on Rarotonga, although the Titikaveka Growers Association is keen to develop one, either in support of their own village or as an island-wide operation.

Tania also noted the need for investigations into the optimum composting conditions for local wastes. Most guidelines (eg. from New Zealand and Australis) were based on the range of materials used in those countries and did not consider any specific requirements for materials commonly used in the Cook Islands, such as palm fronds and seaweed. In addition, there should be some research into how to achieve the most appropriate nutrient mix for island conditions.

Finally, she noted the probable need for a transfer station system – eg. at the landfill – so that green waste can be set aside from other wastes and redirected to the composting facility.

Waste Oil

Waste oil disposal is an issue for the Cook Islands and has become more difficult in recent years due to the presence of 3 competing oil companies, and the lack of regulatory systems (on oil supplies) to help drive a recovery programme.

NES has been authorising waste exports under Waigani for some years but needs to put this on a more rigorous footing by developing a regulation under the Environment Act. Also, they would benefit from having a manual that lays out all of the required approval documentation and cargo labelling/tracking/documentation requirements.

National Waste Strategy

This document was first developed as a draft in about 2004 and has undergone several reviews and iterations since then, but without ever being finalised. Tania believes that the main problems relate to a lack of any coordination mechanism between departments and the need for a more integrated approach. In addition, the matter of public versus private sector involvement is still being debated and while that remains unresolved NES (and others) are unclear as to how to proceed (ie. as a regulator or an administrator).

Training, Education & Awareness

Tania had no specific suggestions for staff training needs. However, there is a range of capacity building activities noted in the draft NIP for the Stockholm Convention.

Ministry of Infrastructure and Planning (MOIP)

The contact person for this visit was Tai Nooapii. MOIP manages the contracts for rubbish collection and operation of the landfill on Rarotonga. They are currently considering setting up a green waste shredding and composting operation at the landfill, but need a shredder. They would consider the option of this being run by the private sector, either at the landfill or elsewhere. They also acknowledge the need for trials of the most appropriate conditions for composting local wastes, and the need to ascertain the likely waste quantities and demand for compost (but noted that the shredded green waste can also be used for daily landfill cover).

Titikaveka Growers Association (TGA)

Maureen Hilyard and I visited the TGA site, but none of the key people were there. However we were given a site tour and outline of the operation by one of the workers. The TGA chairman later made contact with Maureen, after I had left Rarotonga, and I have since been corresponding with the Office Manager of the association.

The current composting operation is very rudimentary in that they are simply shredding and chipping green waste, mixing it into piles with other wastes, and leaving it to digest. However, they see this as only a first step and are very keen to develop it into a proper composting operation.

TGA has existed for many years as an informal association of the growers living in and around Titikaveka village. However, in the last few years they have moved towards a business mode of operation, including establishing an association office and operating to a formal business plan. They already have a viable processing operation for Noni Juice and a fish hatchery. The plans for the compost operation are linked with a nursery, which will provide a consistent supply of seedlings to the growers. Compost is available at no charge to all growers and other members of the public.

The TGA currently has an application in with NZAID to support some of their activities.

Waste Oil

There are 3 oil companies operating in Rarotonga, although one of these – Pacific Petroleum – is primarily involved with servicing the aviation sector. The notes below cover meetings with the other two companies, the power company and a laundry that uses waste oil in its boilers.

Te Aponga Ura (Rarotonga Power)

A meeting was held with Kevin Powell, who manages fuel deliveries at the port, and contact was also made with technical personnel at the power station. The power station used to import oil through BP and the contract required BP to take back the waste oil, which was sent back to Fiji as deck cargo on the fuel tankers. With the change in oil companies, the oil is now being imported by Triad Petroleum and there is no take-back clause in the contract. Also, the option of sending it as deck cargo is not available to Triad because the tankers are not under their direct control.

The power station generates about 80 drums (16,000 litres) of waste oil per year and has a stockpile of about 250 drums (50,000 litres) on site, which was accumulated over about the last 3 years.

Triad Pacific Petroleum Ltd

The meeting was held with Graeme J Wiig, Manager. Triad is a privately owned local company. They import lube oil using shipping containers, with the oil in drums (for the power station and other bulk users) and retail containers. They do not collect or export any waste oil.

Container shipping to Fiji is unlikely to be an option for waste oil because there is no direct shipping service. The cost of sending a shipping container to New Zealand is NZ\$4800 to \$5400, and a

container can hold 80 drums of oil (= \$0.30 to \$0.34 per litre). As with most other goods, there is no duty on imported oil because most duties were dropped with the introduction of the VAT system.

Triad also operates a new hot-mix bitumen (asphalt) plant, and is investigating the use of a 10% mix of waste oil in the diesel burners. However, this would only be a minor use.

Toa Petroleum

The meeting was with Okirua Apera, Operations, Business & Aviation Coordinator. Toa is a privately-owned local company. They import oil in drums and retail containers, and offer a take-back service to their customers (but not others). The service includes provision of IBC containers which are placed with some of their larger users (eg. truck repair shops) and collected on a regular basis. The full containers are stored on the TOA site awaiting export.

TOA have been exporting the waste oil to New Zealand for several years now. They have nominal approval under Waigani for 1 container per year (16,000 litres), and the waste is received by Salters Cartage, who operate the main NZ waste oil collection programme (most of the oil is used as fuel in a cement kiln). There is a current problem in that the latest request for approval of a shipment appears to have fallen into a black hole" in the NZ Ministry of Economic Development.

TOA currently pays all of the costs for in-country collection, storage, port handling and shipping, and estimates an overall direct cost of \$0.35 per litre, plus ~\$0.05 for staff time, etc. They also have to pay for the second-hand IBCs used for storage and shipping, at a cost of about \$200 each, which is 50% of the as-new price. TOA would be happy to support and/or operate an island-wide collection and export programme, and they could also extend it to the outer islands that they currently supply with fuel. However, the costs would need to be met by some sort of levy system.

Snowbird Laundry

I met with Mathew Grierson, the owner. This is the only large laundry on Rarotonga, primarily servicing the hotel industry. They had one of their two boilers converted to burn waste oil several years ago and the unit appears to be operating well, with a clear stack. They are currently burning about 100 litres of oil per day, 6 days a week, so can use all of the power station production, including working through the existing stockpile over the next 2 to 3 years. There have been some difficulties with the power station demanding significant payments for the oil, but these have been resolved with an agreed payment of \$50 a barrel (\$0.40 per litre).

Hospital Incinerator

A meeting was held with Ngo Min, Maintenance Manager. The hospital incinerator was provided about 5 years ago under a JICA/WHO programme. The unit is currently malfunctioning, in that the secondary burner cuts out automatically after about 30 seconds of operation. The POPs NIP Project has offered to pay for somebody to come over to service it.

In the longer term there is clearly a need for the staff to be trained in correct operation and maintenance practices for the incinerator. It may also be helpful to equip them with basic test equipment, such as a temperature probe, so that they can better monitor the system performance.

Laboratory Wastes

Some significant stockpiles of lab chemicals were identified during the POPs NIP Project, held in government and school labs, and the local hospital. On this visit, Maureen Hilyard and I returned to the labs and obtained lists of the unwanted chemicals. A specialist NZ waste management company has been contracted to come to Rarotonga to dispose of the chemicals, using a range of locally

relevant treatment methods where appropriate, with the rest being shipped to NZ. They will also deliver a one-day training session in safe storage, handling and disposal.

Further training in lab safety will be appropriate and may need to be repeated every few years because there appears to be a high turnover of lab personnel.

New POPs

The nine new POPs were assessed as part of the NIP Project. The Fire Services hold 10 tonnes of a fire-fighting foam which most likely contains PFOS. The only other significant issue identified was the potential for BDEs and PFOS to be present in imported manufactured articles and in the wastes arising from these articles. There is currently no capacity in the Cook Islands for identifying or testing these articles for the presence of POPs, or for requiring the information to be provided by importers.

4.2 Fiji

Visit dates: 28 February – 4 March 2011.

Department of the Environment

A meeting was held with Aminiasi Qareqare (Senior Environment Officer), Lusiana Ralogaivau (Senior EO, working on waste matters and permitting) and Laisani Lewanavanua (EO, similar duties to Lusi but also involved with the current regional POPs monitoring programme – air and breast milk - funded under GEFPAS).

Waste Oil

None of the meeting participants had any significant knowledge of the Fletcher's waste oil collection programme, although they were aware that the company held the necessary permits. They confirmed that all of the oil companies had permits for their terminal operations and also their petrol stations, although it later became clear to me that some of the applications were still being assessed and processed. Generally permits had not yet been issued for vehicle servicing and repair sites, although they are required under the Environment Act.

They indicated a willingness to get involved with promotional/awareness activities for a national waste oil collection programme, although this was prior to my meeting with Vishwa Reddy at Fletcher Steel. I now think it would be more appropriate for them to be assisted with a campaign to promote and complete the permitting requirements for vehicle servicing and repair sites. Also, as indicated in the Fletcher Steel notes, there is a need for significant improvements in the overall permitting process.

I suggested that they should consider carrying out a waste oil audit under the project, after training, which should also cover other waste streams. The audit would aim to obtain data on the total quantities of lube oil coming into the country and then track it through the stages of storage, sale, use and disposal. Ultimately, this would help to identify where and how much oil was being disposed as waste, and the users that should be targeted for further action.

Composting

There has been a significant amount of work done in this area through the JICA programme, although this was mainly at a pilot level so a lot more could be done to extend it out across the country. JICA has taken an old dumpsite in the west, near Lautoka, made some modest improvements to the site, and set up a demonstration composting operation. They have already held field days for people from other municipalities, but it was people suggested the same could be done for people at the local authority and rural village level. JICA have also done some work with

the Nadi dump, but they have had no involvement with the new Naboro landfill outside Suva, which was developed by the EU.

JICA has also promoted community-based/home composting through the provision of composting bins and training in selected villages. Once again this could be extended out across the country.

The Environment people were keen to see a public education and awareness programme to promote the methods and benefits of composting, including programmes in schools. They also suggested this should be based around a holistic approach, including the benefits of home-grown food, healthy eating, etc – to be done in conjunction with the Department of Health.

Waste to Energy

A ground-breaking ceremony is being held next week for the proposed development near Sigatoka. However, other than that the Environment people knew very little about the project, and I was unable to track down anybody who does.

Chemicals

As far as the Environment staff were aware, there has been no significant improvement in the situation regarding unwanted lab chemicals that was identified in the Fiji NIP. Lai receives regular phone calls from schools and other labs asking for assistance with chemical disposal, but has been unable to identify any suitable disposal options.

No work has been done by the department in relation to the new POPs.

Capacity

The meeting concluded with a general discussion on the capacity within the department for implementing or participating in the GEFPAS project. Everybody agreed that this would only be viable through provision of funding for a Project Officer.

Secretariat of the Pacific Communities

I met with Shakil Kumar, Energy Advisor, who works in the Energy Division of SPC and is involved in a range of activities related to petroleum fuel supply in the Pacific. He previously worked for BP and was directly involved with their waste oil management systems, including obtaining permits from the Department of the Environment (which took about 12 months to be processed). He worked for the Department of Environment prior to joining BP. He confirmed that the BP wastes were collected on a regular basis by Fletcher Steel and that the system was working well.

He felt that there would be significant barriers to introducing oil disposal levies in most countries, even at a rate of \$0.50 per litre, which represents about 5% or less of the wholesale price for oil. SPC have been pushing for improvements in fuel quality that could cost no more than \$0.01 or \$0.02 per litre and even these have been strongly rejected by governments.

Shakil was well-aware of the problems regarding waste oil production and existing stockpiles around the region. He noted that Nauru was importing about 3 million litres of waste oil per year from Australia, for use in the phosphate dryers. They currently have to meet the cost of shipping but would be very keen to tap into any cheaper option (eg. with costs being shared).

SPC would be very interested in any proposals for demonstration projects for alternative uses of waste oil because they would fit into their regional energy efficiency programmes. He provided me with contact details for Nauru and for the Fiji oil companies, and offered to cover waste oil issues for us in Niue because he is going there next week, with an enforced stay of 7 days.

Fletcher Pacific Steel

The initial contact was with Hira Lal, but I spent most of the time with the Manager, Vishwa Reddy.

Fletcher Steel produces steel reinforcing rods and other steel bars at this site. They import steel billets, heat these in a furnace and then pass the steel through a rolling mill to form the products. Waste oil is used to fire the furnace. If the oil is relatively clean and of the required quality they can use it directly. However it is often necessary to blend different supplies to obtain a mixture of the desired quality – viscosity being the main determinant. The wastes from oil terminal slops tanks and, to a lesser extent, petrol stations, are often problematic because they can include mixtures of other products such as diesel and kerosene.

In the past, the mill was burning about 2 million litres of waste oil, with about 1.2 million of that being used for steel production and the remainder for maintaining the furnace temperature during idle periods. The quantities are down at present due to a combination of business downturn, and competition for oil supplies (see below). However, the company is anticipating a reasonable level of growth over the next few years. Also, as noted in the report by Mark Ricketts, they would be interested in pursuing a waste-to-energy option, should the quantities of waste oil increase substantially.

The company has developed a significant waste oil collection programme within Fiji, over the last few years. This has been done at the company's own initiative, but has also been driven by the new permitting requirements under the Environment Act. Nominally, all of the oil terminals, petrol stations and vehicle servicing businesses are required to obtain permits for their operations, and these include a requirement for proper collection and management of site wastes, including oil. Fletcher Steel has three permits relating to the waste oil operation; one for the oil collection operation, one for on-site oil handling and storage, and one for oil use in the furnace.

All of the oil companies have waste oil collection and storage tanks at their terminals and at each petrol station, in keeping with their permit requirements. Fletcher Steel provides a regular collection service for these wastes at no cost to the oil companies.

Bus and truck companies and vehicle repair shops are also required to hold permits, although this would appear to be a work in progress within the Department of Environment. However, Fletcher Steel has already provided substantial assistance in this area. For the larger operations they are supplying specially-designed 1000-litre storage tanks, which they fabricate at the mill, at a cost of about FJ\$1000 per tank. They also provide advice on the design and construction of the bunded storage areas (and supply at-cost reinforcing steel) and training in the proper use of the system. Smaller operations are provided with 200-litre drums.

To date, the company has provided 20 of the large tanks and an unknown (but described as 'a lot') number of drums. They are currently producing 2 tanks a month and expect the total number of installations to rise to at least 100. I visited three of the installations with Vishwa and they all looked to be very well designed and constructed, and properly managed. In addition, each company is required to enter into a fairly detailed contract with Fletchers regarding their participation in the programme.

The costs of the oil collection programme are also carried by Fletcher Steel. In the past they used a contractor, at a cost of FJ\$7000 per month. However, they now have their own small tanker truck. The operating costs for this are not available (but could be taken as equivalent to the contractor costs), and the staff time and management costs are estimated to be FJ\$15,000 per year. (Mr Lal had earlier indicated collection costs of about \$0.10 per litre, which is reasonably consistent with

these figures). They have also spent \$300,000 in upgrading the furnace, the burners and the fuel handling system to obtain optimum operating conditions.

They have a large empty tank on site at present which is to be installed in the western part of Viti Levu to act as a collection depot for that area.

One point that Vishwa raised – and he was very concerned about it – was current competition for waste oil from a private operator who is buying the oil at \$0.05 per litre and selling it to the Emperor Gold Mine for use in their low temperature furnace. Apparently this company is only targeting the better quality oil, which creates problems for Fletchers in having to do more processing of the lower grade wastes. At present, this is jeopardising the future viability of the operation – it would be easier for them to just buy clean furnace oil and pass the costs on to their customers. In addition, Vishwa has concerns that, while the other company has a permit for its activities, there are significant inconsistencies in the standards applied by the Department of Environment in assessing permit applications, and enforcement is almost non-existent. He believes that the other company's operations are well below an appropriate standard.

Fletcher Steel has previously received waste oil from overseas but the current imports are almost nil. They would be very interested in receiving the wastes from other Pacific countries, including the large stockpiles, and would cover all port handling and transportation costs within Fiji. This includes import duty of \$0.02 per litre (which should be discouraged under the project). Vishwa also noted the importance of having oil/water separators in the source country, mainly to avoid the losses involved with paying for shipping and import duty on unwanted water.

It was interesting to find that Vishwa had no knowledge of the approval requirements under the Basel and Waigani Conventions, and nor did the people spoken to in the Department of Environment. Vishwa's situation could possibly be explained by the oil companies having acted as importing agents in the past, and the Environment situation most likely relates to staff turnover and/or unapproved (illegal) imports. Whatever the reasons, there is clearly a need for significant strengthening in this area, especially for Customs and Environment, but also for Fletchers.

Looking forward, I can see no need for any immediate moves to establish an EPR programme for waste oil collection in Fiji. The existing permit system under the Environment Act provides a suitable driver for achieving collection from all industrial and commercial users and it would be more appropriate to look at what is needed to ensure that the system is being applied consistently and effectively across all users. The only value in an EPR programme would be to pick up domestic sources of waste oil. However, this has several issues including the fact that oil is brought into the country by a range of importers – not just the oil companies. Also, there often problems with contamination by other waste liquids in the oil obtained from public collection systems. I think this option should only be explored after the industrial/commercial collections are operating smoothly and effectively.

In the case of exports from other countries, we should be looking to get these moving as soon as possible because the demand for the oil is already there. EPR systems will probably be more appropriate in these countries because there are no commercial drivers for the collection programmes. I would suggest these be initially restricted to industrial and commercial users, for the same reason as noted above for Fiji. Also, the power stations should be treated as a separate programme as indicated below.

Pacific Power Association

A meeting was held with Gordon Chang, Deputy Executive Director and Andrew Daka, Senior Advisor – Power Sector. The PPA is a CROP agency representing power companies and electricity distributors throughout the Pacific. They also have working contacts with Pacific Rim developed countries, mainly through the suppliers to the power industry. They carry out a range of activities in support of their members (see www.ppa.org.fj) including an annual conference which rotates around the different countries (Guam in 2011) and is usually held in June of each year.

Power stations are the major producers of waste oil in many Pacific Island countries and most of them are accumulating significant stockpiles because, for a variety of reasons, their past options for disposal have come to an end. Most power stations in the Pacific use conventional (but relatively large) internal combustion engines powered by diesel oil. They operate to a fixed maintenance schedule that requires oil changes at regular intervals (eg. every 1 to 3 months). A single large engine can produce 200 litres of relatively clean waste oil at each oil change.

The following examples illustrate the typical oil quantities for power stations: the station on Rarotonga has a stockpile of about 250 to 300 drums (50 to 60,000 litres) of waste oil which has been accumulated over the last 2 to 3 years, while the one on Majuro has 1,530,000 litres accumulated over the last 4 to 5 years. According to Andrew, Palau has a stockpile similar in size to RMI.

The PPA has been concerned about the waste oil issue for the last few years, especially the accumulating stockpiles. Andrew has obtained data on the current stockpiles for all of the ‘northern’ utilities. He estimated that he would need to find about US\$0.5 million to cover the shipping of all of these stockpiles to Fiji (eg. the cost for sending a single container with 80 drums (16,000 litres) of oil from Palau to Fiji is US\$5000). He also had an indication from some potential US buyers that they would take it away for a fee of \$0.60 per litre to cover shipping and handling. He recently put forward a proposal to the US Embassy for a small-grants fund to tackle one small part of the problem, but the initial response was not encouraging.

Andrew will send me his stockpile data by email and will request similar info from the southern utilities. The PPA is keen to participate in the GEF project on behalf of their utility members and I will explore this further with them over the next few weeks. An initial thought that I had was that we set up a separate sub-component of the project for power stations, and that would allow us to have a separate technical advisory committee facilitated by the PPA, but working in conjunction with the AFD Technical Advisor and any other relevant consultants, coordinators, etc. The committee would mainly communicate by email and possibly telephone conference calls, but could also meet in person at the annual conference, hopefully with the AFD rep and/or SPREP also in attendance. All of which should amount to a reasonable co-financing contribution.

Obviously, there are two separate issues to address through the project; stockpile disposal and the on-going waste production. I assume most of the stockpiles will be beyond the GEF budget, so we will probably need a project component to explore alternative funding options. As for on-going waste production, I’m tempted to suggest that we aim to equip utilities to deal with this directly, rather than working through environment agencies (other than for the export approvals that have to go through the Competent Authorities). And rather than pushing for national oil levies or importer responsibilities, it should be more cost-effective for the utilities to be assisted in setting up their own in-house disposal funds. Ultimately, I would envisage production of a manual (published by the PPA) on utility oil management and disposal.

The PPA would also be interested to see work on alternative in-country options for waste oil, such as use in boilers or other industrial furnaces.

Oil Companies

There are three main oil companies operating in Fiji: Mobil, BP SWP Ltd (trading as Pacific Energy) and Total Fiji Ltd. Other key players include the Carpenters group of companies, who act as distributors for Mobil, and Supreme Fuel Ltd. All of these companies import lubricating oil and it is also brought in for retail sale by a range of other importers and retail outlets.

I obtained contact names for the three oil companies from both the Department of Environment and Shakil Kumar. However, this information was only obtained late in the week and when I telephoned some of the contacts they were either away from the office or unavailable during the remaining time. Others indicated that they were not the most appropriate people to talk about waste oil.

The net effect of all this is that I did not meet with any of the contacts. However, I don't see this as a major issue because, as indicated above, I do not see the Fiji oil companies as having a significant initial role in the project. If they did come in at a later stage their primary roles would be in making their existing oil collection tanks accessible by the public, and making information leaflets available at their retail outlets – neither of which would amount to a significant co-finance contribution.

4.3 Samoa

Visit dates: 7 – 10 March 2011.

Ministry of Natural Resources & Environment (MNRE)

A meeting was held with Mr Faleafaga Toni Tipamaa, Assistant Chief Executive Officer – Division of Environment and Conservation, Mrs Fuatina Matatumua-Leota, Principal Officer, DEC (Chemicals Management) and Ms Katenia Rasch, Senior Officer, DEC. Katenia is currently responsible for the SAICM 'quick start' project in Samoa.

This was a highly productive 2-hour meeting because all 3 people had taken the time to read through the PIF in advance and had some very clear ideas as to how the work would fit in with Samoa's current interests and requirements. Their only concern was that some of their priorities had changed, and new issues had arisen, since the PIF was originally drafted.

Waste Oil

Waste oil is recognised as an issue for Samoa, but mainly because MNRE appear to have no idea as to how much oil comes into the country or what happens to it when it becomes waste. The concept for a chemical tracking system has been developed under the SAICM project, and they thought that this would provide a good starting point for developing an understanding of oil imports, distribution and fate. It was also noted that the new Waste Management Act allowed them to pass regulations requiring importers and users to take responsibility for the disposal of their wastes. They would welcome financial and technical assistance with the drafting of the relevant regulations, either just for waste oil or, preferably, for all potentially hazardous wastes.

They were reluctant to adopt a levy system for funding the oil collection and disposal operation, because many people in Samoa are already concerned about excessive taxes and other government charges (eg. VAT at 15%). There is already provision for a proportion of Customs duties to be refunded on the export of some recyclable goods, and it may be possible to extend that to lube oil. (According to PPS, the current import duty on oil is 8%). It was agreed that the preferred approach would be for MNRE to get all relevant stakeholders together at the start of the project to map out the issue, the potential costs, and the available options for meeting those costs.

MNRE are already doing some export approvals under the Basel and Waigani Conventions. However, they indicated that they required more training in this area. They would also welcome some assistance with drafting the relevant regulations to give the system official recognition. It was noted that one of the biggest problems they currently have is with getting Customs to play their part. This includes identifying cargoes that require export or import approvals (and stopping the cargoes if approvals have not been obtained), and collecting relevant and useable export/import data. In theory, the latter information is already being collected but Customs appear to be incapable of producing any useful summaries or reports.

Composting

MNRE indicated that composting has already been very well covered in Samoa and they saw no need for further demonstration projects. However, they would be keen to see financial support for on-going/regular education & awareness activities. MNRE has its own education & awareness team so can (and do) develop the necessary programmes and materials in-house, including in the Samoan language. However, their operational budget is only about 20,000 Tala per year, so they usually have to rely on external funding to cover the costs for TV and radio broadcasting. Many visitors to Samoa will be aware of the regular appearance of environmental ads on local TV.

They agreed that some of the MNRE E&A staff time could be counted as in-kind funding and will be happy to work with us to work out other in-kind contributions.

Cleaner Production

The medical waste incinerator at the Tafiagata landfill is about 10 years old now and, according to MNRE, no longer operating as well as it should (but see separate JICA notes below). They would be happy to have the staff given training in correct operation and maintenance, although it may be time to look at replacing the unit. They believe the hospital staff are doing a good job with waste segregation, etc, and that the Ministry of Health have this aspect well under control. No further training is required.

Chemicals

Katenia agreed to send me a summary of the work done under the SAICM project, which includes development of a conceptual chemical tracking system. They would therefore be interested in having training in aspects of chemical database management. An inventory of unwanted lab chemicals has just been prepared under the project, but is not yet ready for distribution. They will supply a copy when it is. Also, there are 2 containers at the landfill, one full and the other half full, of miscellaneous 'chemicals' that they have accepted in the past from members of the public.

MNRE fully supported the proposal for training of lab staff on sound chemical management practices, safe handling and use, and proper disposal. They also suggested the need for guidance in the design and construction of school laboratories – apparently Samoa is currently looking at upgrading many of its secondary schools, and this would include new labs.

They also supported the provision of relevant chemical safety training for MNRE and Customs personnel.

Finally, they are keen to pursue the development of new legislation to provide an overall framework for chemicals management in Samoa. This would help to address the current fragmentation that arises from different aspects and/or types of chemicals being covered under different legislation and different government agencies.

Vocational Training, Education and Awareness

They are all very keen to see staff being given on-going training and will provide a list of nominees. They also suggested two other topics – the Globally Harmonised System (for hazard ID and labelling) and environmental monitoring/testing.

E&A programmes were generally supported (see composting notes) and they suggested two other specific topics; anti-burning, and POPs generally.

Project Management and Delivery

MNRE expressed a clear preference for any Samoa components of the project to be funded directly through their department rather than via an intermediary agency. They believe they have a proven track record in this regard; eg. their management of the Samoa NIP project, in which funds were disbursed directly to them by the UNDP regional office.

MNRE – GEF Services

I met briefly with Steve Brown, Assistant Chief Executive Officer – GEF Services (Samoa). Steve and Fuatina were directly involved in the original drafting of the PIF for this project, so he was pleased to hear that it was now progressing. Steve will provide input to the cost estimates for the MNRE in-kind contribution.

Petroleum Products Supplies Ltd (PPS)

Samau Etuale Sefo, Managing Director.

PPS is the sole importer and distributor of petroleum fuels for Samoa, with a current supply contract with Exxon-Mobil. PPS is a 100% Samoa-owned company and has two sister companies; Polynesian Shipping and Pacific Oil – the latter is a producer and exporter of coconut oil.

PPS imports the Total range of lubricants, with annual quantities of 160 - 200,000 litres a year, which includes engine lubricants, hydraulic and transmission fluids, and gearbox oil. The other major suppliers are Gold Star and Samoa Spare Parts, but there are also numerous other smaller importers, because the market is unregulated. A few years ago, Etuale estimated the country's total oil imports at about 800,000 litres per year and agreed with my *per capita* estimate of about 1 million litres.

They do not have any disposal system for their site wastes, and are currently storing about 50 drums of waste oil and 'slops' on site. People occasionally take some away for other uses (eg. a Fire Service training exercise). He has previously spoken with MNRE and indicated that PPS would be happy to get involved with a collection and disposal programme, but it would only be viable if the government introduced a funding system, such as a levy. There may also be some set-up costs, such as for a storage tank, oil/water separator, etc.

Etuale said that the two major waste oil producers in Samoa would be the power stations and the Samoa Shipping Corporation (from servicing of the engines on the inter-island ferries). He is aware of drums of waste oil being disposed at the landfill and dumped into streams, with the power station being a particular concern.

Etuale was also interested in the possibility of using waste oil in their coconut oil processing plant. They have a diesel-powered boiler which could possibly be converted to run on oil, and would also be interested in generating their own electricity because Samoa power charges are very high. I offered to get him the contact details for the people who converted the boiler in Rarotonga.

Electric Power Corporation (EPC)

A meeting was held with Tony Atilua, Manager Generation. Tony is based at Tanugamanono, the site of the one and only power station on Upolo, within the broader Apia urban area. The station has four generator units and there is another station with five smaller units on the island of Savaii, near Salelalogo. There is a new 23MW power station under construction at Fiaga to the east of Apia and once it's commissioned three of the Tanugamanono units will be shut down.

The Tanugamanono station generates about 36 drums of waste oil a year and currently has a stockpile of about 40 drums on-site. They are planning to install a 10,000 litre tank for storage because the drums tend to rust. They are also interested in developing a more appropriate waste handling system because, at present, the engine oil gets mixed in with oil/water wastes produced elsewhere in the process. They do get requests for oil from the public for marking sports fields, etc. And Tony admitted that there may be some dumping going on.

We discussed the option of sending waste oil to American Samoa for use in the canneries. This would be a cheaper transport option, using the inter-island ferry, but is not without its difficulties. The ferry would have to be chartered for a special run, so the volume of oil would have to be quite substantial to spread the costs. Also, there would be significant 'international' barriers, because the US is not a Party to Basel or Waigani, and is unlikely to be in the foreseeable future.

Tony had a very positive response to the waste oil project proposal and is keen to get involved. He indicated that once the old units are decommissioned, the Tanugamanono site could possibly be used as a storage/transit site for all of the oil collected on the island. He would be happy to have EPC included as a contributor in-kind.

Betham Brothers Enterprises Limited

I met with Mark Betham, Managing Director, Hugo Betham, Operations Manager, Lorenzo Fepuleai, Transport & Stevedoring Manager, and Ateni Penina, Shipping Manager. Betham Brothers is one of the largest shipping, freight handling and transport companies in Samoa, so were an ideal contact for information on shipping and for discussions on the current storage and disposal practices for waste oil. Also, they were interested to hear about the waste oil project because of the potential business opportunities.

After I outlined the project to them, Lorenzo commented that some shipping companies were reluctant to handle drums of waste oil because of problems in the past with spillages and leaks. Hugo indicated that there were only two Australian container ships that went from Apia to Suva, with most others travelling from Fiji to Samoa and then on to other destinations. However, this still gave two trips per month, which would be far than that needed to service any waste oil shipping requirements. He undertook to obtain shipping costs for me, including checking whether the companies would (a) agree to carry the waste oil, and (b) place any additional restrictions and/or costs on the cargo (such as requiring the containers to be lined with plastic).

In terms of waste oil management, Lorenzo indicated that there was no organised collection or disposal system in Samoa. They store their waste oil in drums at the trucking depot, and get a steady stream of people wanting to take it away for uses such as the marking of sports fields, rust-proofing old vehicles, and the treatment of timber. When the demand is less than the supply, they have occasionally taken drums to the Tafiagata landfill, where they are buried within the refuse.

JICA

I spent some time with Shiro Amano to try and better understand the J-PRISM project and to explore the potential linkages with GEFPAS. The specific activities planned for each country are summarised in an Integrated LogFrame spreadsheet, and the individual country summaries that he provided me

by email. No more specific details are available because either they are still being worked out with each country, and/or they will only be finalised as the project moves forward over the next few years. This particularly applies, for example, to the training aspects which are currently flagged for indicative times and/or countries, but the exact timing, content and scope (in-country or sub-regional) will only be decided closer to the planned dates, and on a country-by-country basis.

We both recognised that there is the potential for major overlaps between the JICA work and GEFPAS, and agreed that it would be important for both project teams to maintain a close working relationship throughout the life of the projects.

The JICA waste project is quite separate from the various JICA Volunteer programmes, which are generally organised by each of the country offices. However, they do work closely together and are always keen to identify opportunities for the Volunteers to collaborate and/or assist with delivery of the waste programme.

In the past, the main focus of the formal waste training programme was the 4-week course held alternately in Okinawa and Samoa. However, the emphasis has now moved to providing much shorter courses with a specific focus, which is often determined by the available case studies within a chosen country. They have also moved towards getting individual countries to organise the workshops on a sub-regional basis, with JICA simply providing the funding, and experts where necessary. In addition, they encourage countries to send their counterpart staff (employed by the government, not JICA) to neighbouring countries to provide workshops, training, etc.

The reliance on local counterparts is a deliberate attempt to build in sustainability – as opposed to the ‘project’ approach where project staff are lost when the money comes to an end. However, this does create problems in that the staff are often also required to fulfil other normal duties.

As a general principle, JICA are not aiming to provide any detailed training in relation to hazardous waste management, or healthcare wastes. By agreement, they have left the latter to WHO, and have previously relied on SPREP for covering hazardous wastes.

The most recent JICA work in Fiji was based around two dumpsites in Nadi and Lautoka. They have made site and operational improvements and are also doing some basic composting on site. They have also promoted home composting, including the provision of locally-made plastic bins. They hope to soon produce a pamphlet/manual on home composting, based on the Fiji work, for distribution around the region. Shiro saw no problem with the GEFPAS/AFD training programmes using these sites for field visits, etc, but noted this would need to be organised through the local counterparts in the municipal Health Departments. Generally JICA will not have an on-going presence at the sites.

Finally, we discussed medical waste incinerators. In the past, JICA and WHO have supplied quite a few units within the region, although JICA’s role was mainly as a supplier, while WHO were supposed to cover installation, operation, maintenance and training (and had a highly variable track record). The one unit that Shiro was happy with is the Samoa one, which he says is going very well. They had it overhauled in 2009 and have since provided a second unit for Savaii. (I don’t know how this relates to the Aussie unit that we may hear about at the Nadi workshop because I didn’t see the email on that until later in the day).

4.4 Papua New Guinea

Visit dates: 14 – 18 March 2011. (This visit was made jointly with Mark Vaughan, so some of the matters that are only touched on briefly here may be given more detailed coverage in Mark’s notes).

Department of Environment and Conservation (DEC)

Our primary contact point and visit facilitator was Veari Kula, Manager, Industry Standards Branch. We also met briefly with Gunther Joku, the Acting Secretary. Michael Wau, Director, Environmental Protection (Veari's boss) participated in both the introductory meeting held on 14 March and the stakeholders' meeting on the 15th, and I had a debrief session with him on the last day of the visit. Both of the meetings with DEC covered a wide range of topics, but only the main points have been noted below.

Stakeholders' Meeting: In addition to Michael and Veari, the participants were:

Gregory Lenga, Principal Scientist, DEC (also in the introductory meeting)

Vivianne Morofa, Environmental Health Officer, National Capital District Council (NCDC)

Katrina Solien – Manager, International, DEC (and former POPs Project Coordinator)

Michael Bongro, Executive Manager, Policy and International, DEC

Frank Griffin, Executive Dean SNPS, University of PNG (and ex SPREP)

Robin Totome, Lecturer SNPS, UPNG (former consultant to the POPs project)

Main Points Arising (in no particular order)

- DEC needs capacity building for all aspects of waste management and for Basel/Waigani
- The JICA project is covering rehabilitation of the NCDC landfill and improvements to the rubbish collection service
- Waste training should cover DEC staff and also NCDC
- PNG generates many different types of hazardous wastes and in significant quantities, especially in relation to its major industries (eg. mining, oil, timber, etc), but has no significant treatment facilities and very little knowledge (within DEC) on what is required
- DEC has no hard information on oil imports, storage or disposal, although some staff believed there were large volumes being stored in tanks and drums.
- Possible users of waste oil include the cement plant at Lae, 3 or 4 steel mills and some of the mines (but in later discussions some people were uncertain as to whether or not some of these plants were suitable and/or could actually use the oil).
- DEC produced a motor industry Code of Practice some years ago, which may be relevant to waste oil management within that sector.
- The situation regarding medical waste incinerators was also confusing. Most people seemed to agree that the one at the main hospital in Port Moresby was no longer operational (and very old) and that no action had been taken over installing and commissioning a replacement unit, which had been available for many years. There are 19 public hospitals in PNG and all have some sort of medical waste disposal facility but these range from very crude to only just acceptable. There is also a private hospital with an incinerator but, once again, uncertainty as to whether it was still operational.
- Training in chemical safety should draw on the expertise already available within the PNG 'chemical' industry, and at UPNG and other tertiary institutions.
- The chemical training should include tertiary sector participants and be designed with sustainability in mind, eg. with the goal of setting it up as a permanent university course.
- UNITEC in Lae already offers courses in chemical risk management.
- The Safety Council has published a number of chemical safety guideline documents and provides workplace health & safety training courses for a fee. However, these would not be accessible to government employees because of the cost.
- DEC has been discussing a POPs clean-up programme with AusAID, who are supportive of the idea. However, nothing has yet been decided, and a key obstacle is the need to have it prioritised by the PNG government within the bilateral programme.
- UPNG is developing an undergraduate degree course in waste management, which will probably get under way in 2012.

- There is very little composting being done in PNG so DEC would be keen to see this promoted, including the benefits to environment and health.
- Nothing significant has been done in relation to the new POPs.
- Many of the actions included in the draft NIP have already been picked up in the DEC Corporate Plan. Similarly, the Health Department has some specific plans in place for addressing medical wastes (but indication of actual action).

Project Implementation

In later discussions with Veari it was agreed that any work required under GEPAS would be taken on by him and others within DEC, as part of their normal work load. However, it would help greatly if the project could support a Project Technical/Admin Assistant to ease the workload.

PNG Power Ltd (PPL)

We met with Titus Tsigese, Environmental Officer. PNG Power was originally established as the PNG Electricity Commission (ELCOM) with the sole responsibility for the development, generation, transmission, distribution and sale of electricity throughout the country. ELCOM was privatised in 2003, although it appears that the government is still the primary share holder.

There are only two 'large' oil-fired power stations in PNG, one at Moitaka (serving the Capital and surrounding districts) and the other in Lae. However, there are numerous other small diesel units throughout the country, some owned by PPL, others by private operators (eg. mining companies), and some by villages. PNG also has significant generation using hydro plants, and is gradually adopting solar systems as well.

The Moitaka power station has a current waste oil stockpile of about 1 million litres (to be confirmed). Titus will get back to us with more precise figures for this and for Lae, including annual waste generation rates. They have previously had enquiries from potential users, such as a Casava/Biofuel plant and bitumen plant operators. However, the discussions have not come to anything.

Titus also raised the PPL problems with old transformers, PCBs, etc, which are clearly spelt out in the PNG NIP.

PNG Customs Service

Meeting with John Pomoso, Deputy Commissioner – Regional Operations and 2 others (Mark Vaughan has the details). The discussions here were mainly focused on training, and education/awareness. They were reasonably confident of their understanding of the requirements for transboundary waste movements. However, previous comments from DEC suggest the need for some targeted training and/or awareness activities, and some in-country assistance to bring DEC and PNS together to better understand each other's requirements and how they can be met.

PNG Gardener

We met with Justin Tkatchenko, Managing Director. PNG Gardener has a contract with NCDC for maintenance of the city streets and gardens. They also have several plant nurseries, are developing a zoo/theme park, and operate retail gardening stores. They currently turn all of their own green waste into compost/mulch for use in the raised gardens, etc, and also bag and sell it in the stores. Justin believes there is a much greater demand for the product than they can currently service. They also run regular TV ads that promote composting or mulching.

Our discussions centred around the possibility of setting up a demonstration green waste collection project in a selected Port Moresby community. Most of this would be run by DEC and/or NCDC, but Justin indicated that he would be happy to receive the wastes and turn it into useable product.

(Veari suggested a good target community would be the suburb of Rainbow. Frank Griffin had previously suggested the UPNG residential settlement, but we all felt this would not be typical of PNG urban communities.)

Inter Oil Limited

I met with Karlo Terz, Corporate HSE Manager, Robert Lamond, Facilities Supervisor (Refinery), Matha Zeriga, IPL HSE Manager, Turon Jorah Neofa, Refinery HSE Auditor, Compliance, and 3 others. InterOil is a Canadian-owned company but most of its operations are in PNG. It operates an oil refinery at Napa Napa and is one of the main retail distributors of petroleum fuels. They do not manufacture lubricating oils but import them.

Within the last year, InterOil has recognised that they need to do something about the large volumes of waste oil, and other oil-related wastes that they have been accumulating at their various operational sites. They are currently developing a facility at the refinery for storing and processing oily wastes, with the aim of producing reusable products of a consistent quality that will be acceptable to potential users such as the cement plant, and SP Brewery. However, this is targeted solely at the wastes generated from their own operations. They are aware of numerous other companies holding large stockpiles of waste oil.

They have previously had discussions with the Curtis Brothers' cement plant regarding the use of waste oil but these did not come to anything. One particular issue was that the cement company wanted to be paid to take the waste oil.

They would be interested to get involved with any waste oil project because of the benefits of working together with others to identify possible oil users, either within PNG or overseas. They recognised the issues associated with transboundary shipping.

They indicated that while the oil companies in PNG all communicate quite regularly with each other, they did not normally work together on 'commercial' matters.

Ministry of Health (MoH)

A meeting was held with Joel Kolam, Health Advisor – Environmental Health, Aaron Kopi, Environmental Health Officer, and Terry Daniel, Department of Health. Joel indicated that healthcare waste management was in a very poor state throughout PNG, mainly because hospitals did not have, or did not allocate, the necessary funds to ensure that it was done properly. Waste disposal is not regarded as an integral part of the delivery of health care services.

Most hospitals had incinerators but most were either not operating or in a very poor state of repair. Another problem was the lack of funds to pay for the required fuel. And where incinerators are still in use, the staff need training in correct operation practices.

There is a 'new' incinerator in Port Moresby that has never been commissioned due to the lack of funding and/or commitment. It appears to have been available for many years.

WHO has previously run a programme on proper healthcare waste management (segregation, etc), but MoH suspect that the recommended practices are not being followed in most hospitals.

The MoH has been developing a healthcare waste management policy over the last few years, but it has not yet been adopted. Even when it's in place, it will only be effective if it is properly implemented and enforced. Hospitals are relatively autonomous when it comes to budgeting and operational matters so would need to be 'persuaded' to adhere to it.

It was agreed that there were a number of key issues that should be addressed:

- Education and awareness on the need for proper waste management, including the associated costs of doing it properly (they saw this as the top priority and agreed that it should include Decision Makers, and hospital managers and staff)
- Hospital staff training in waste segregation practices, and training for incinerator operators
- A survey/audit of all hospitals in PNG to establish current waste management practices and key areas for improvement
- An economic assessment of the costs of waste management and ways of accessing the necessary funds
- Assessment and commissioning of the unused incinerator in Port Moresby

4.5 Questionnaire Responses for Waste Oil

The responses to the questionnaire on waste oil management are summarised in table 4.1, which is given on the next page. This also includes information gathered during the country visits.

Table 4.1: Summary of Key Information on Waste Oil

Country	Annual Waste Volume Estimate (litres/year)	Current Stockpile Estimate (litres)	Organised Collection?	Direct Container Shipping Route to Fiji?	Shipping Costs (approx. for a 20ft container)	Current Regulatory Drivers?	Party to Basel/Waigani?
Cook Islands	15 - 30,000	50,000	Oil depot drop-off	No (only to NZ)	US\$3500	None	Yes/Yes
Fiji	>2 million	none	Fletchers collect from main sources	not applicable (n/a)	Not applicable	Permitting system under Env Act	No/Yes
FSM	unknown	2 million	none	No	tbd	None	Yes/Yes
Kiribati	unknown	none	Oil depot drop-off	Yes	US\$4500	None	Yes/Yes
Marshall Islands	350,000	1.5 million	none	No	tbd	None	Yes/No
Nauru	unknown	none	none	No	Not needed	None	Yes/No
Niue	18,000	14,000	Yes (Public Works)	No (only to NZ)	~US\$3500	None	No/Yes
Palau	unknown	150,000	none	No	tbd	None	No/No
PNG	unknown	1 million	none	No	Not needed	None	Yes/Yes
Samoa	15 - 50,000	18,000	none	Yes	US\$1500	Could regulate under Waste Act	Yes/Yes
Solomon Islands	unknown	none	none	Yes	US\$2000	None	No/Yes
Tonga	unknown	none	Oil depot drop-off	Yes	US\$1500	Existing regs	Yes/Yes
Tuvalu	unknown	2,000	none	Yes	US\$4000	None	No/Yes
Vanuatu	unknown	none	none	Yes	US\$2000	Currently under development	No/Yes

(tbd = to be determined once the most appropriate export destination is confirmed)

5. Gap Analysis

Each of the tables below provides a gap analysis based around the possible components of systems for organic waste management and oil reuse and disposal. It should be noted that the entries in the third columns of the tables (possible responses to the current situation) are based around the work likely to be done under the GEF-PAS project, rather than any wider response scenarios.

5.1 Organic Waste Management

Table 5.1: Gap Analysis for Organic Waste Management

Component	Current Situation	Possible Responses
1. Policies, Plans and Strategies	In 2009, National Solid Waste Management Strategies had been developed in 6 PICTs ⁴ and were under development in 10 others. Waste minimisation strategies were under development in 6 PICTs. The Stockholm Convention NIPs include specific actions to discourage burning in 7 PICs ⁴ and promotion of composting in 5.	Component 1 of the GEF-PAS project will support the development of regional and national uPOPs ⁴ prevention strategies. Wherever possible these should be incorporated into the broader waste strategy documents. In addition, SPREP may wish to consider the development of a guidance document on the possible components of a national waste minimisation strategy.
2. Waste Characterisation	Waste composition data is available for 11 PICs, although some of the information is quite dated.	No additional data is needed for the GEF-PAS project. However, PICTs should consider future composition studies as a means of monitoring the effectiveness of any waste minimisation and/or organic waste diversion programmes.
3. Organic Waste Projects	There have been numerous regional, national and community based composting projects done in the past, with varying degrees of success. Large scale composting activities appear to be the most challenging in terms of finding ways to ensure long-term viability	There appears to be little need for any new projects on composting at the domestic or village level (but see 6 & 9 below). However, larger-scale activities would benefit from additional work, with an emphasis on economic aspects and compost quality.
4. Anaerobic Digestion	This is a well-established process for animal wastes but has not been effectively demonstrated for municipal wastes in PICTs.	Some Pacific-based research on the potential for application to municipal wastes would be advisable before considering any support for demonstration projects in this area.
5. Waste to Energy	Several projects are either currently under development or at the planning stage. However these are all highly capital intensive projects and well outside the potential project budget for GEF-PAS.	None of the developments is sufficiently advanced to allow linkages to the GEF-PAS project design.
6. Education and Awareness	Numerous E&A activities have been conducted in the past, mainly with a focus on domestic composting. However, long-term behaviour changes are only likely to be achieved through continuing efforts over many years.	The vocational training under Component 2 of the GEF-PAS project will cover most aspects of organic waste management. There will also be an awareness campaign on alternatives to burning. In addition, the information produced through composting pilot projects (item 3 above) will be disseminated throughout the region.

⁴

PIC = Pacific Island Countries, PICTs = Pacific Island Countries and Territories; uPOPs = unintentional POPs.

Component	Current Situation	Possible Responses
7. Guidance Documents	There are numerous guidance documents available on composting methods and other aspects of organic waste management. However, most are relatively generic and do not address the most appropriate methods for using the specific waste materials available in the Pacific region. The 'commercial' aspects of composting are also not covered	The proposed pilot projects on composting will include consideration of these aspects, and the results from the projects will be disseminated throughout the region.
8. Laws and Regulations	The waste-related laws in the region can be mainly categorised as enabling legislation, and do not provide any specific controls on organic waste management. This is appropriate because of the general lack of well-established treatment and disposal options within the region.	Those PICs that currently lack the enabling legislation should be encouraged to develop it, although this would be more appropriately done under the wider regional waste programmes, rather than through the GEF-PAS project.
9. Economic Instruments	PICs have yet to use economic instruments as a driver for organic waste management which, again, is appropriate because of the general lack of well-established treatment and disposal options within the region.	Most likely, the potential uses of economic instruments will only become apparent once the proposed pilot projects are finished (for example, if large-scale composting is shown to be commercially viable, it may be appropriate to introduce levies to discourage other disposal options such as landfilling).

5.2 Waste Oil Reuse and Disposal

Table 5.2: Gap Analysis for Waste Oil Reuse and Disposal

Component	Current Situation	Possible Responses
Policies, Plans and Strategies	The disposal of waste lubricating oil has long been recognised as a problem in the Pacific Islands region. However, this has not been reflected in the development of any specific policies, plans or strategies, either at a national or regional level. The major impediment to doing so is the general lack of any widely available and viable reuse and disposal options.	The reuse and disposal of waste oil is a specific component of the GEF-PAS/AFD project. The development of national or regional policies may be appropriate once a viable reuse/disposal process has been demonstrated under the project.
Waste Characterisation	Estimates of the current waste oil stockpiles are available for most PICs (see section 6.2). However, most countries have a very poor understanding of their current oil imports, usage and disposal.	This will be addressed through the proposed waste oil audit activities under the project.
Oil Reuse and Disposal	There is a waste oil recycling facility on Guam, waste oil is being collected and reused in Fiji, and several PICTs are successfully exporting their waste oil for recycling or reuse in other countries. However, most are not.	The GEF-PAS/AFD project aims to establish waste oil collection systems in each PIC and will provide support for export operations to suitable reuse facilities in other countries.

Organic Waste and Waste Oil Strategy Enhancement

Component	Current Situation	Possible Responses
Waste to energy	Waste oil is used as a fuel in Nauru, the Cook Islands, Fiji and American Samoa and some of the current proposals for waste-to-energy plants indicate that they will have the potential to burn waste oil.	The GEF-PAS/AFD project will specifically support the reuse of waste oil in Fiji and will also explore the options for reuse in PNG. The current uses in Nauru and American Samoa are unlikely to continue because the plants are to be shut down.
Education and Awareness	Some PICTs provide general advice on the need to avoid oil dumping. However, more specific E&A activities are only appropriate once an effective collection and disposal system is in place.	The GEF-PAS/AFD project will include an E&A component to promote the use of the oil collection and disposal facilities.
Guidance Documents	The only specific guidance document identified within the region relates to the approval processes for exporting waste oil under the Basel Convention.	Guidance documents for waste oil management and oil export processes will be developed under the project.
Laws and Regulations	Waste oil management is subject to regulation in Fiji and may also fall under some of the more general environmental legislation in other PICs. Waste oil exports are subject to the control systems required under the Basel and Waigani Conventions.	The development of appropriate laws and regulations may be appropriate once viable collection and disposal systems are in place.
Economic Instruments	No economic instruments have been applied to waste oil management within the region.	The possible development and use of economic instruments will be explored under the GEF-PAS/AFD project

6. Outline Work Plans

This section presents the outline work plans which were produced under the consultancy for use in developing part of Component 2 (organic waste demonstration projects) and all of Component 4 (Waste Oil) of the detailed Project Design Document for the GEF-PAS project. The section on organic wastes consists of proposals for pilot projects on composting in the Cook Islands and PNG. A related proposal for composting in Niue was produced by Mark Vaughan under a separate consultancy. Mr Vaughan also prepared several other work plans to address other elements of Component 2 (vocational training and education & awareness) and the strategy development work envisaged for Component 1. The work plans for Component 3 (Chemical Management) were prepared by Melanie Ashton.

6.1 Organic Waste Management

6.1.1 Composting Pilot Project for the Cook Islands

Background

Composting and mulching of green waste is already well established in Rarotonga at the household level. There is also one community-scale composting operation, but this is in a very early stage of development. Significant amounts of green waste are sent to the landfill, and the household burning of green wastes has been identified as one of the more significant sources of releases of unintentional POPs.

This project will be based around the existing community-scale composting operation, which is run by the Titikaveka Growers Association (TGA). The current composting operation is very rudimentary and simply involves the shredding and chipping of green waste, mixing it into piles with other wastes, and leaving it to digest. However, TGA see this as only a first step and wish to develop it into a proper composting operation but currently lack the necessary financial resources and technical expertise

TGA has existed for many years as an informal association of the growers living in and around Titikaveka village. However, in the last few years they have adopted a business mode of operation, including establishing an association office and operating to a formal business plan. They already have a viable processing operation for Noni Juice and a fish hatchery. The plans for the compost operation are linked with a nursery, which will provide a consistent supply of seedlings to the growers. Compost is available at no charge to all growers and other members of the public.

Project Outline

The aim of the pilot project will be to develop the current TGA activity into a full-scale composting operation. In the first instance the project will provide expert assessment of the existing operation and advice on the changes necessary to achieve effective and efficient compost production. Once the recommended changes are implemented the project will monitor the quantities of green waste input and compost production, and trials will also be carried out on the most appropriate mixes of raw materials. The trials will include process monitoring using a temperature probe, simple physical and chemical tests for product quality, and growing trials.

Green waste is currently delivered to the TGA site on an ad hoc basis by Association members and other members of the public. However, the TGA will start collecting green waste in a more systematic way, using their own vehicle, once the operation is running smoothly, and to the extent necessary to service the demand for compost. An organic waste diversion operation will also be set up at the landfill, with the assistance of the Ministry of Infrastructure and Planning (MOIP). In the first instance only a limited amount of organic waste will be separated out from the general waste

stream, in accordance with the quantities required by the TGA composting operation. However, the quantities will be gradually increased over time as TGA increases their capacity for processing more wastes, and as demand for the product increases.

Once the project has been operating routinely for 12 months, the data on waste inputs and compost production will be reviewed, along with estimates of production costs and market demand (based on a survey), to develop an overall strategy for maintaining the operation as a viable business.

The pilot project will be managed directly by the TGA office, although a monitoring and reporting mechanism will be set up through the National Environment Service (NES). TGA currently operates with a mixture of voluntary and paid staff, and it will be appropriate for an additional paid Project Officer position to be established under the pilot project. The project will also need to contribute towards some labour costs.

The results from this pilot project will be disseminated jointly with those from PNG and Niue, through incorporation of a case study in the later stages of the AFD vocational training programme, and presentations at any relevant regional meetings or workshops. The results will also be used in the production of a regional organic waste strategy, and an organic waste handbook.

Project Outcomes

- Development of the existing TGA composting operation into an efficient and sustainable business operation that produces quality compost suitable for use in Cook Island gardens
- Dissemination of the results both within the Cook Islands and throughout the region.

Indicative Work Plan and Timing

1. Recruit Project Officer and establish a project Liaison Committee involving TGA, NES and MOIP (month 1)
2. Consultant assessment of the existing operation, staff training, and recommendations for process improvements, project trials and monitoring (month 2)
3. Purchase temperature probe and other basic test equipment (month 3)
4. Implement process improvements and commence composting trials (month 3 to 6)
5. Commence green waste diversion programme at the landfill to the extent dictated by TGA capacity (month 7)
6. Continue routine composting operations and start data collection and processing (months 7 to 18)
7. Promote the availability of compost through local media and monitor changes in demand (months 10 to 18)
8. Carry out a market survey (willingness to pay and demand for product), production cost analysis, and production capability assessment (waste availability versus processing capacity) (month 18)
9. Expert assistance to prepare a business analysis and recommendations for maintaining the operation as a viable business (month 19)
10. Implement business plan and monitor progress at 6-monthly intervals (months 20 onwards)
11. Case study write up and publication (months 21 and 22)

12. Other dissemination activities: incorporation of a case study in the later stages of the AFD vocational training programme, and presentations at any relevant regional meetings or workshops, development (by or through SPREP) of a regional organic waste strategy and an organic waste handbook (months 22 onwards)

6.1.2 Composting Pilot project for PNG

Background

There is little or no waste separation practiced in PNG and only a limited amount of work has been done on promoting the use of composting to reduce the volumes of green waste sent to landfill. The Department of Environment & Conservation (DEC) has identified composting as a priority area of interest for the GEFPAS project in PNG and wishes to undertake promotional activities on the benefits to health and the environment. In addition, there would be significant benefits in demonstrating the potential for a green waste collection programme in urban areas such as Port Moresby.

Project Outline

The scope of the pilot project will be demonstration and evaluation of a green waste collection programme in the Rainbow suburb of Port Moresby. This pilot project will be done in parallel with the proposed education and awareness activities on home composting. The project will be run jointly DEC and the National Capital District Council, which is responsible for waste collection and disposal in Port Moresby. A Technical Assistant will be required to support the work within DEC, with this position being shared across the waste oil and composting project activities, and extending over a period of 3 years (to ensure that the later follow-up activities are adequately supported by DEC).

The Rainbow suburb is close to the campus of the University of Papua New Guinea (UPNG). The proximity to the campus will make it easier to utilise students, who will be recruited to carry out much of the on-the-ground dissemination of information and data gathering. In addition, UPNG staff will be invited to participate in the project as technical advisors, and will also assist with the analysis and reporting of the results.

The project will be based around approximately 100 households and will run for a period of about 3 months during the wet season (November to April), which is the peak time for green waste generation. Each household will be provided with a green-waste collection bag, made of hessian or an equivalent synthetic fabric, with a capacity of 250 to 500 litres. After training, the students will provide the householders with one-on-one instruction in the use of the bags, and the contents of the bags will be collected once every 2 weeks. The volumes of green waste collected each fortnight will be estimated, and the wastes will be assessed for the extent of contamination by unwanted materials, such as plastics. The wastes will be delivered to a site occupied by the company PNG Gardener. The Managing Director of this company has agreed to accept and process the waste into a compost/mulch product. There will be no charge for the processing, but the company will be free to use the product in its own garden maintenance activities, or to sell it to the public.

The results from the collection programme will be assessed to determine the potential volumes of green waste available in Port Moresby, the cost and logistics of collection, the cost of compost production, and the most appropriate strategies for minimising contamination. A survey will also be carried out to determine the potential size of the market for the product.

A local consultant will be engaged to work with the NCDC to develop a strategy and costed work plan for setting up a regular green waste collection programme in all, or parts, of Port Moresby. The project will maintain contact with NCDC, including providing technical advice where necessary, to ensure that the agreed programme is developed. The programme would most likely be operated by a company contracted to NCDC, which may or may not be PNG Gardener.

The results from the project will be presented at a national workshop and will also be detailed in a formal written report. In addition, DEC and NCDC will have follow-up discussions with other councils who may be interested in replicating the work and will assist them, where possible, with setting up their own studies.

Wider dissemination of the study will be achieved with the assistance of SPREP, and would include incorporation of a case study in the later stages of the AFD vocational training programme, and presentations at any relevant regional meetings or workshops.

Project Outcomes

- Execution of a demonstration project on green waste collection and composting, in the Rainbow suburb of Port Moresby
- Use of the project results by the NCDC to design and implement a green waste collection and composting programme across all or parts of Port Moresby
- Dissemination of the results to other PNG municipalities, and on-going assistance to promote replication
- Dissemination of the results throughout the region.

Indicative Work Plan and Timing

1. Recruit project Technical Assistant (month 1)
2. Establish Technical Advisory Committee, including participants from DEC, NCDC, UPNG and PNG Gardener. Confirm commitment and inputs to the project by all parties (month 1)
3. Purchase green-waste bags and prepare instruction sheets, publicity materials and data record sheets (month 2 & 3)
4. Recruit students and provide training (month 4)
5. Arrange for vehicle hire (one day per fortnight), including a driver and 2 labourers for waste collection (month 4)
6. Distribute bags to target households and provide instruction in their use (month 5)
7. Fortnightly collections begin soon after bag distribution, with waste delivered to PNG Gardner for composting (month 5 or 6).
8. Students estimate waste volumes during each collection exercise, carry out a qualitative estimate of the extent and type of contamination and provide feedback to householders when necessary (months 5/6 to 8).
9. Data/info analysis and reporting with input from UPNG staff and economic assessment by a local consultant (months 9 and 10)
10. Consultant works with NCDC to develop a strategy and costed work plan for setting up a regular green waste collection programme (months 10 and 11)
11. National workshop (month 12)
12. Case study write up and publication (months 13 to 15)

13. Other dissemination activities: discussions with other councils who may be interested in replicating the work; incorporation of a case study in the later stages of the AFD vocational training programme, and presentations at any relevant regional meetings or workshops; development (by or through SPREP) of a regional organic waste strategy and an organic waste handbook (months 22 onwards).

6.2 Waste Oil Reuse and Disposal

Background

The key points arising out of the country visits and the questionnaire responses (as reported in section 4) are as follows:

- 1) Countries that are not Parties to the Waigani Convention (ie. Marshall Islands, Nauru and Palau) cannot export waste oil to Fiji unless they enter into an equivalent bilateral agreement with Fiji.
- 2) The project will not be able to remove all of the existing stockpiles, especially the very large ones in FSM, Marshall Islands, Palau and PNG. The shipping costs alone for these would be more than 1 million dollars.
- 3) For those countries with no direct container shipping route to Fiji, it will be more cost-effective to ship the oil to other countries (eg. Cook Islands and Niue to New Zealand). This will also apply when Fiji is a lot further away than other potential disposal countries (eg. PNG to Australia, and Palau to the Philippines).
- 4) An effective waste oil collection system has already been established within Fiji, and is expected to continue growing over the next few years. This has been partly driven by a permitting system under the Environment Act, but is largely due to the efforts of Fletcher Steel Pacific who provide a collection service to all of the oil companies. In addition, Fletchers have provided storage tanks (at their own cost) and a collection service to 20 of the larger oil users (eg. bus and truck depots) and they also provide drums to smaller operators. Eventually they expect to have supplied tanks to about 100 waste producers.
- 5) Some countries have only a very limited understanding of their current oil imports, waste oil production patterns, and disposal practices. This especially applies to Fiji, PNG, Samoa, Kiribati, Nauru, Palau, Solomon Islands and Tonga and should be addressed by a waste oil audit exercise at the start of the project.
- 6) Nauru is importing waste oil for use in the phosphate driers and currently has no requirement to export.
- 7) There are several possible options for using waste oil within Papua New Guinea, which should be fully explored before any decision is made to export.
- 8) Power stations are the major producers of waste oil in many of the countries, and in some of the smaller ones they are the only significant source. Contact has been made with the Pacific Power Association (PPA) who have agreed to participate in the project to assist in coordination on aspects of particular relevance for the power companies.
- 9) All countries spoken to indicated a need for training and guidance on the approval and reporting procedures required under the Waigani Convention.
- 10) There is also a need for regional guidance on oil management practices at the user (ie. waste producer) level. In the interests of sustainability, it would be appropriate for the project to include preparation of several manuals on oil management, including one specifically for power stations (in conjunction with the PPA), another for oil companies and

large industrial users, and a third for vehicle workshops and service stations. Papua New Guinea already has a Code of Practice for vehicle workshops which may serve as a suitable model for the latter, and the multinational oil companies have produced guidance material which would provide a starting point for the oil company and power station manuals.

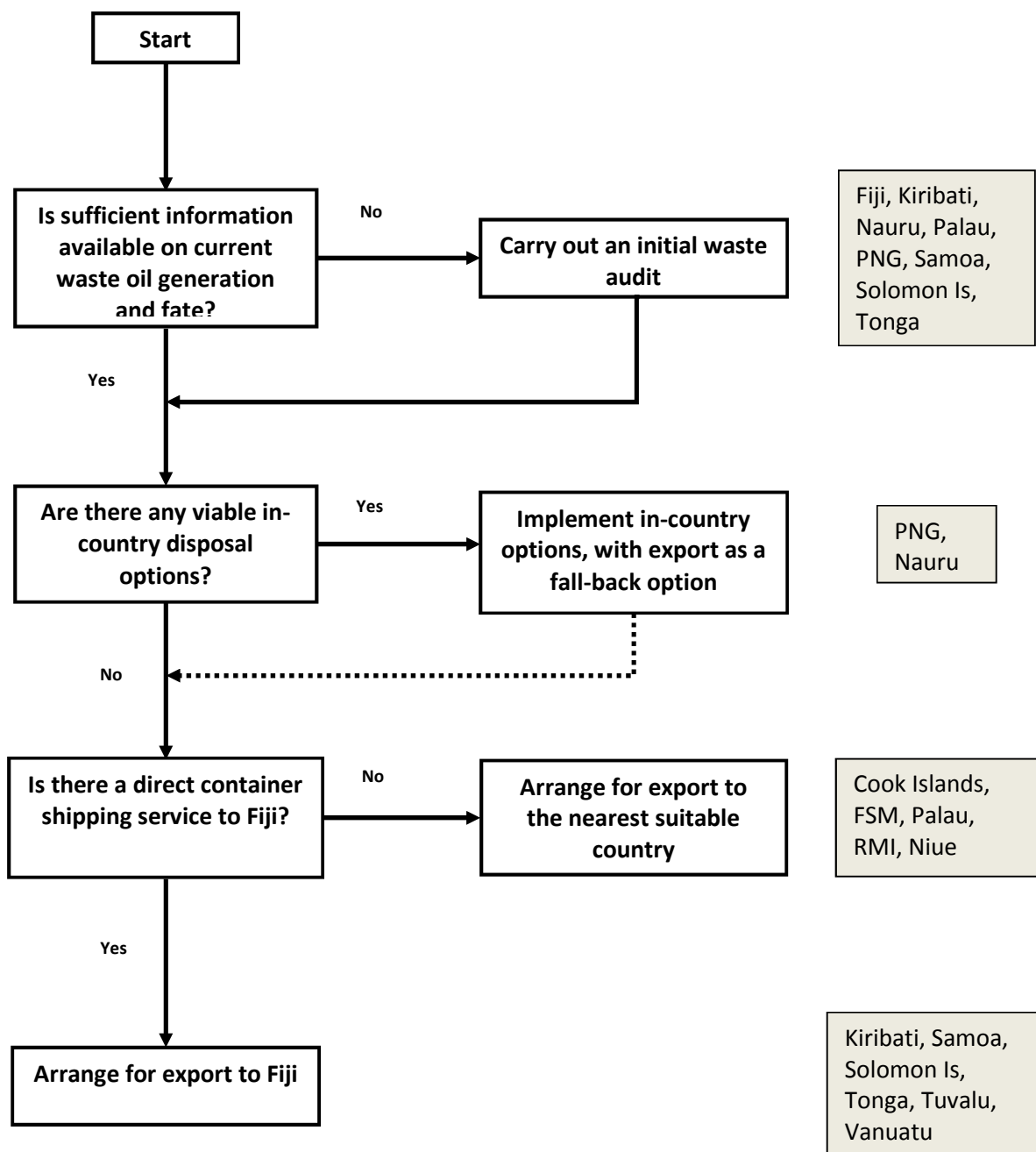
- 11) It was noted during the regional workshop that any in-country disposal options for waste oil should be assessed to ensure that the burning conditions would meet the relevant requirements for minimisation of unintentional POPs. This includes the phosphate dryer on Nauru and any proposed disposal facilities in PNG.
- 12) Some, but not all, of the waste oil is contaminated with water, which should be removed prior to shipping so that the exporter is not paying to transport dirty water rather than oil. The original project design included the provision of storage facilities and oil/water separation systems in each country. These will not be needed in those countries where suitable facilities already exist. The only country with a confirmed need for an oil-water separator is Samoa (at the Apia power station). The need for facilities in other countries will be assessed on a case-by-case basis later in the project.
- 13) The Federated States of Micronesia noted that there was some urgency in developing appropriate in-country storage facilities as most waste oil was stored in drums, which were at risk from rusting through. The Marshall Islands also noted a need for urgency on developing a disposal programme as the current storage system was close to reaching its maximum capacity.
- 14) The original project design also aimed to set up waste oil collection systems in most countries at an early stage in the project. Once again, it will not be necessary to do this prior to the first shipments. In addition it may never be necessary in smaller countries where the number of oil producers is limited and they already have an established drop-off system. If collection systems are to be set up in a country, this should only be done after the storage facility is established.
- 15) The operation of an effective and permanent waste oil collection and disposal system is highly dependent on establishing suitable funding arrangements in each country. The first shipments of waste oil will assist in providing the relevant cost information.
 - a. In those countries where there is only one oil importer (eg. Kiribati), or one dominant waste oil producer (eg. Tuvalu), the logical approach is for them to build the disposal cost into their sale prices or operational budgets. Most power stations should also be encouraged to adopt the same approach. The project may need to provide economic or accounting advice to show how this could be done.
 - b. In those countries with a multiplicity of oil importers and/or waste oil producers, a suitable funding mechanism will need to be established on a case-by-case basis. The appropriate drivers already exist in some countries (eg. the permitting system in Fiji and regulations in Tonga) but will have to be developed in others. The project should assist each country with identifying the most appropriate approach (eg. regulatory or economic instruments) and with implementing the agreed option.
 - c. In the case of Fiji, the permitting system is currently having some affect but is very slow. The specific proposals for Fiji aim to enhance this.
- 16) Several countries indicated the need for assistance with developing regulations to support waste oil collection and disposal. This included Tonga (where existing regulations do not

cover small scale users), Samoa, Palau and the Solomon Islands. PNG was also interested in the development of economic instruments for promoting good waste oil management.

- 17) Technical advice provided at the regional workshop indicated that all drums or IBC containers used for shipping waste oil must be certified as complying with UN regulations.

Decision Tree

The decision-making process used to determine the waste oil export options for each country are shown in the figure below.



Proposed Project Components

- 1) Establish a stakeholder consultation mechanism within each country to ensure effective involvement of all key contributors.
- 2) Waste oil audits to provide information on current oil imports and waste generation and disposal practices in those countries where this information is currently lacking (Fiji, Kiribati, Nauru, Palau, PNG, Samoa, Solomon Islands and Tonga). In addition, the audits will be repeated after about 3 years to assess the effectiveness of the actions taken.
- 3) Set up and completion of an initial oil shipment from all countries, except for Fiji, Nauru and PNG, to demonstrate all of the necessary procedures, provide detailed cost information, and identify any organisational or logistical issues.
- 4) Technical assistance to agree on and put in place the necessary arrangements for further shipments, including setting up collection, storage and treatment facilities, and the development of appropriate regulatory and/or economic instruments.
- 5) Preparation of a Handbook, and regional training on the documentation, approval and reporting processes required under the Basel and Waigani Conventions.
- 6) Preparation of guidance manuals or handbooks on waste oil management for oil importers and distributors, power stations and small users, such as vehicle workshops.
- 7) Education and awareness programmes in relation to the need for proper oil management, and for the specific waste oil collection systems established within each country.
- 8) The above activities will be varied for Fiji, which has no need to export. The work in Fiji will include strengthening the existing permitting system for waste oil producers to ensure that as much waste oil as possible is being recovered and collected for reuse.
- 9) The work in Papua New Guinea will be targeted at identifying and implementing local options for reuse, subject to demonstrating that the proposed options can perform at the standard required to ensure that the production of unintentional POPs is minimised.
- 10) The reuse facilities in Fiji and Nauru will be audited to ensure that they are being properly operated and managed, including the provisions for uPOPs minimisation.

Proposed Approach

- 1) Stakeholder workshops in those countries with a multiplicity of oil importers and/or users (Cook Island, Fiji, Kiribati, Palau, PNG, Samoa, Solomon Islands and Vanuatu) and one-to-one consultations in all others, to explain and agree on the proposed programme, including key participants and contributors.
- 2) Waste oil audits in Fiji, Kiribati, Palau, PNG, Nauru, Samoa, Solomon Islands and Tonga to provide information on current oil imports and waste generation and disposal practices. Initial training in audit procedures will be given by a consultant but the audits will be done by local personnel. Audits are not needed in countries with only a limited number of waste oil producers (ie. Cook Islands, FSM, Marshall Islands, Tuvalu and Vanuatu).
- 3) Preparation and planning for an initial oil shipment from each country, including obtaining necessary drums or containers, confirmation of the most appropriate export destination, obtaining all necessary approvals, including completion of the documentation required under the Basel and/or Waigani Conventions.
- 4) Completion of the first waste oil shipment from each country.
- 5) Technical assistance and stakeholder consultations to identify and agree on the arrangements for further shipments, including setting up collection, storage and treatment facilities, and the development of appropriate regulatory and/or economic instruments.

- 6) The project will then provide on-going financial and technical support to assist with implementation of the agreed approach within each country.
- 7) Education and awareness programmes will be developed and delivered in each country with assistance from the Project TA. These will address the need for proper oil management, including oil spill response, and promotion of the specific waste oil collection systems (once established) within each country.
- 8) Waste oil audits will be repeated in each country after 3 years to assess the effectiveness of the oil collection activities and the education and awareness programmes.
- 9) Preparation of guidance manuals or handbooks on waste oil management and oil spill response for oil importers and distributors, power stations and small users, such as vehicle workshops. These will be prepared in consultation with PICs and, where possible, will draw upon existing documents, including guidance documents published by the multi-national oil companies, and the PNG Code of Practice for vehicle workshops.
- 10) Preparation of a Handbook, and regional training on the documentation, approval and reporting processes required under the Basel and Waigani Conventions. The Handbook will be prepared by a consultant working closely with SPREP, and SPREP will act as convenor for the 3 regional workshops, to be held in 2011, 2013 and 2015.
- 11) The participation of power companies will be facilitated and guided through a Technical Working Group to be established by the Pacific Power Association.
- 12) The work in Fiji will be assisted by a 50% staff position over 3 years, the duties for which will include carrying out the waste oil audits, preparation of a generic Oil Management Plan for adoption by individual sites, facilitation of permit applications under the Environment Act, site inspections and education and awareness activities.
- 13) The work in PNG will be assisted by a 50% staff position over 3 years, the duties for which will include liaison with all key stakeholders, carrying out the waste oil audits, identification, assessment (with assistance from a consultant) and implementation of potential waste oil reuse options.

Project Outline

An indicative project outline is shown in Table 6.1

Table 6.1: Waste Oil Project Outline

Component Number and Detail		Timing	Comments
1	Confirm country commitment, designated contact personnel, and a stakeholder liaison group for in-country implementation	Sub-project start, months 1 to 2	Project Assistants will be required in PNG and Samoa to cover this and other GEFPAS activities. A Project Officer should be appointed in Fiji to lead the oil work, and assist with permitting.
2	Stakeholder workshops in Cook Island, Fiji, Kiribati, Palau, PNG, Samoa, Solomon Islands and Vanuatu, and one-on-one stakeholder consultations in all other countries.	Months 3 to 7	Workshops and other stakeholder consultations facilitated by
3	Training then implementation of waste oil audits in Fiji, Kiribati, Palau, PNG, Nauru, Samoa, Solomon Islands and Tonga	Months 3 to 9	Training given by an Audit Consultant. Timing varies by country; eg. countries 1 & 2 in month 3, countries 3 & 4 in month 4, etc
4	In-country assessments of interim storage needs in FSM and RMI, and the most appropriate export options for FSM, Palau and RMI	Months 3 to 9	Done by countries with assistance from the AFD TA or an Audit Consultant (in parallel with steps 2 and 3).
5	Identify in-country requirements for a first oil shipment, obtain necessary supplies (drums or IBCs), confirm shipping company and shipping costs	Months 3 to 10	Done by country personnel after guidance from AFD TA or Audit Consultant (start at same time as steps 2 and 3)
6	Obtain formal agreement from Fletcher Steel to accept first shipments	Months 5 to 12	Country personnel, through AFD TA
7	Obtain necessary Waigani approvals	Months 5 to 12	Country personnel, assisted by AFD TA
8	First shipments are tested for PCBs and then shipped, with feedback provided to the AFD TA on any issues arising	Months 6 to 13	Managed by country personnel, shipping companies and Fletchers, with all reporting back to AFD TA as necessary
9	Stakeholder workshops or consultations and technical assistance to explore funding and/or regulatory options, and infrastructure requirements for local collection, storage and treatment facilities	Months 13 to 18	In-country workshops, consultations and technical assistance delivered by AFD TA
10	Financial and technical support to implement agreed requirements in each country (most likely in PNG, Samoa, RMI, FSM, Palau and Vanuatu)	Months 15 to 30	AFD TA and other personnel inputs as necessary
11	Preparation of a handbook for oil exports under the Waigani Convention	Months 18 to 24	Consultant in conjunction with SPREP and AFD TA
12	Support for further oil shipments from selected countries, depending on available funds	Months 20 to 42	AFD TA

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13	Development and delivery of targeted education and awareness activities, as appropriate in each country, to promote the oil collection programme and discourage oil dumping	Months 20 to 48	Country personnel with assistance from AFD TA. Initially targeted at larger users. Only target smaller users when collection programme has been developed to a mature stage.
14	Preparation of Oil Management handbooks or manuals for power stations, oil companies and other large oil users, and vehicle workshops	Months 25 to 36	Consultants working in consultation with PPA, oil company representatives and country personnel
	Other Parallel Activities		
15	Initial regional workshop/training on the Waigani Convention	Mid 2011	SPREP in conjunction with Stockholm Convention Secretariat
16	Further training/workshops on the Waigani Convention procedures, including use of the Handbook produced under step 10 above	Mid-2013, 2015	SPREP (funded by GEFPAS) and held back-to-back with SPREP meetings.
17	Formation of PPA Technical Working Group at 2011 Annual Conference, to liaise with AFD TA and assist as appropriate with project activities, including funding options and drafting of the Power Station manual	Mid-2011 then as required	Working Group to meet at each annual PPA conference and communicate with AFD TA by email in between times, through a designated representative
	Special Programme for Fiji		
18	Initial waste audit and stakeholder workshop as above (steps 2 and 3)	Months 3 & 4	Training and Audit over 6 weeks, followed by workshop
19	Development of a generic Oil Management Plan (these have to be submitted in support of permit applications)	Months 5 & 6	Prepared by Project Officer in consultation with key stakeholders and with support from AFD TA
20	Rolling programme of site visits to either review existing permit applications or to initiate new applications	Months 7 to 24	Initially targeted at 100 larger users
21	Permits issued, followed by site inspections 3 months later	Months 13 to 30	Permits should allow 3 months for implementation
22	Preparation of a Code of Practice for small vehicle workshops, etc	Months 25 to 30	Use PNG Code as a guide
23	Education and awareness activities to promote the programme and discourage oil dumping	Months 31 to 36	Targeted at small users and the general public, using local media
24	Repeat waste oil audit	Months 37 & 39	To monitor effectiveness
25	Final programme report and review	Month 40	Disseminate through region via AFD, SPREP
	Special Programme for Papua New Guinea		

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27	Site visits and meetings with potential industrial users of waste oil in Port Moresby, Lae and other centres	Months 7 to 8	Includes a cement plant, several steel mills, a brewery, bitumix (asphalt) plants, and several gold mines
28	Assessment of the suitability of all identified facilities	Months 9 to 12	External consultant (also see step 36)
29	Negotiate agreements with industrial users over the terms and conditions for accepting waste oil, and the relevant permitting requirements under the Environment Act.	Months 9 to 12	Should include technical assistance to confirm suitability of each plant and to adjust burner systems for operating with waste oil.
30	Stakeholder workshop to outline proposed disposal operations and to agree on appropriate arrangements for oil collection, storage and delivery	Month 14	Initial implementation costs should be borne by waste producers and/or oil users
31	Implement and monitor agreed programme	Months 15 to 30	Should include a simple but formal reporting programme
32	If necessary, investigate and implement options for exporting any surplus	Months 25 to 36	Generally following the procedures given in steps 4 to 7
33	Follow-up audit and stakeholder consultation workshop to review progress and identify any issues or further actions needed, including funding arrangements or regulation.	Months 37 & 38	Hold workshop when audit results are available
34	Investigation and implementation of any relevant regulations or funding arrangements needed to support an on-going operation	Months 39 to 48	Should include technical assistance similar to step 8
35	Education and awareness activities to promote the programme and discourage oil dumping	Months 40 to 60	Initially targeted at larger users. Only target smaller users when collection programme has been developed to a mature stage
	Audits		
36	Assessment of the phosphate plant on Nauru	Months 11 or 12	External consultant engaged for similar work in PNG (see step 28)
37	Audit of the Fletcher Steel oil management activities	Months 25 to 28	Includes support for remedial actions if necessary.

Table 7.3: Budget for Part of Component 2 – Composting Pilot Projects

Object of expenditure against UNEP budget codes		PNG Composting		Cook Is Composting		Comments
Budget line	Description	Cash Cost, USD	In-kind, USD	Cash Cost, USD	In-kind, USD	
10	PERSONNEL COMPONENT					
1100	Project personnel					
	1101 GEFPAS PO (shared with other components)					proportion of time still to be determined
	1102 PNG PA 20%, over 3 years (compost)	\$ 15,000	\$ 10,000			1. other 50% time is spent on waste oil. 2. assume govt maintains position for years 4&5
	1104 PNG govt. staff time & admin support (compost)		\$ 20,000			5 years @ \$4k/yr
	1106 NCDC staff time (PNG compost)		\$ 15,000			3 years @ \$5k/yr
	1107 PNG Gardener, staff time (PNG compost)		\$ 10,000			management time and staff time for composting
	1110 TGA Project Officer (CI compost)			\$ 45,000		\$15k per year over 3 years
	1111 TGA management time, admin, labour for composting				\$ 60,000	includes provision of office space, computer access
	1112 NES project admin and guidance (CI compost)				\$ 15,000	\$5k over 3 years
	1113 MOIP assistance with waste diversion (CI compost)				\$ 15,000	\$5k over 3 years
1200	Consultants					
	<i>Subtotal local task teams</i>					
	1221 UPNG technical advice		\$ 5,000			
	1222 (PNG) local economic consultant	\$ 10,000				8 weeks @ \$250/day
	<i>Subtotal regional consultants</i>					
	1251 (CI) composting consultant	\$ 4,000				1 week in-country, 1 week on-going support @ \$400/day
	1252 (CI) economics/business analysis consultant, Rarotonga			\$ 5,000		4 weeks @ \$250/day
1600	Travel on Official business					
	1601 Travel within PNG to extend composting project	\$ 5,000				10 days travel within PNG
	1602 compost consultant travel			\$ 2,500		1 week in Rarotonga, dsa + fares
20	SUBCONTRACTS					
	2101 (PNG) Student labour for info distribution, data collection	\$ 7,500				10 @ \$50/day, 15 days each over 3-4 months
	2102 (PNG) vehicle hire, driver, 2 labourers	\$ 4,000				8 collections @ \$500 each
	2103 (CI) compost sample analysis			\$ 2,500		10 samples @ \$250 each
30	TRAINING COMPONENT					
3300	Meetings/conferences					
	3301 national workshop on green waste/composting in PNG	\$ 10,000				venue hire/catering @ \$2000 plus internal travel costs (8 people from outside Port Moresby @
40	EQUIPMENT COMPONENT					
4100	Expendable Equipment					
	4101 Green-waste (garden) bags	\$ 500				100 @ \$5 each, including printing and freight costs
50	MISCELLANEOUS COMPONENT					
5200	Reporting Costs					
	5201 PNG compost report	\$ 500				
	5202 Rarotonga compost report			\$ 500		
5300	Sundries					
	5301 Communications,					
	5302 publicity for compost operation, Rarotonga			\$ 500		
	TOTAL COSTS	\$ 56,500	\$ 60,000	\$ 56,000	\$ 90,000	

Table 7.4: Budget for Waste Oil Export and Reuse

Budget line	Description	Cash Cost, USD	In-kind, USD	Comments
10	PERSONNEL COMPONENT			
1100	Project personnel			
1101	PNG PA 50%, over 3 years	\$ 37,500	\$ 25,000	1. other 50% time is spent on other components. 2. assume govt maintains position for years 4&5
1102	Samoa PA, 50% over 3 years	\$ 37,500	\$ 25,000	1. assume govt maintains position for years 4&5
1103	Fiji PA, 50% over 3 years	\$ 37,500	\$ 25,000	1. other 50% time is spent on other components. 2. assume govt maintains position for years 4&5
1104	Fletcher Steel, staff time over 5 years		\$ 57,100	
1105	PPA and power companies, 5 yr		\$ 25,000	\$5k per year
1200	Consultants			
1221	SPREP staff input to Oil Exports Handbook		\$ 10,000	
1222	SPREP staff input to 3 Waigani Workshops		\$ 45,000	
1223	PPA input to Oil Management Handbook		\$ 5,000	10 people @ 1 to 2 days per person
1251	waste audit consultant, 16 weeks	\$ 32,000		2 wks each for Fiji, Kiribati, Nauru, Palau, PNG, Samoa, Solomons, Vanuatu, at \$400/day = \$2000/wk (includes travel and reporting)
1252	economic/regulatory consultant, 8 weeks	\$ 16,000		1 week ea, 6 PICS + travel, reporting
1253	consultant for drafting of Oil Exports Handbook (in relation to the Waigani/Basel Conventions)	\$ 4,000		2 weeks, home office
1254	consultant for drafting of Oil Management Handbooks for power stations, oil companies and large oil users	\$ 12,000		2 week each, home office
1255	consultant to conduct Fletcher site audit	\$ 4,000		1 wk Suva, 1 wk home office
1256	consultant for Nauru and PNG audits	\$ 8,000		1 week, Nauru, 3 in PNG, including travel & reporting
1300	Administrative Support			
1301	SPREP admin support, 3 Waigani w/shps		\$ 15,000	n 2011, 2013 and 2015
1399	sub-total			
1600	Travel on Official business			
1621	AFD TA travel for 1st stakeholder consultations (3 PICS)	\$ 10,000		dsa 21 days @ \$200/day, fares \$6k (Cook Islands, Niue, Tuvalu)
1622	AFD TA travel to 2nd stakeholder workshops in 5 PICS	\$ 17,000		dsa 35 @ \$200/day, fares \$10k (Fiji, PNG, Sol, Van, CI) (+ Samoa at no cost)
1623	audit consultant travel & dsa, 1st s/h workshop	\$ 36,400		dsa 102 @ \$200/day, fares \$16k (Fiji, KiribatSamoa, PNG)
1624	consultant travel for Fletcher site audit	\$ 3,000		dsa 5 days @ \$200/day, fares \$2k
1625	consultant travel for Nauru/PNG audits	\$ 11,000		dsa 28 days @ \$250/day, fares \$4k
20	SUBCONTRACTS			
2101	1st oil shipment from each of 11 PICS	\$ 55,000		\$5k per shipment inclusive of all costs from CI, Niue, Sam, Sol, Tuv, RMI, FSM, Van and Pal (shipments already being supported in Tonga & Kiri
2102	port clearance costs in Fiji		\$ 11,400	paid for by Fletcher Steel
2103	Fiji oil collection programme, over 5 years		\$ 285,500	collections done by Fletcher Steel
2104	oil storage facilities, including oil/water separators, 3 PICS	\$ 120,000		The only country with a confirmed need is Samoa, but the budget assumes more PICS will be added
2105	education & awareness materials for each PIC	\$ 5,000		\$1k each for leaflets and posters, PNG, Sol, Van, Fiji, FSM
30	TRAINING COMPONENT			
3200	Group Training			
3201	1st workshop on Waigani plus other conventions	\$ 90,000		presumably costing more because of international attendees
3202	2nd & 3rd Waigani workshops	\$ 130,000		participant and presenter travel costs (\$60k), venue costs (\$5k), per workshop
3300	Meetings/conferences			
3301	1st stakeholder workshops, 8 PICS	\$ 12,000		3 days each, venue hire/catering @ \$1500
3302	2nd stakeholder workshops, 8 PICS	\$ 12,000		3 days each, venue hire/catering @ \$1500
3303	Power station tech sub-cm'tee metings @ PPA annual conf & by email		\$ 25,000	tbc
40	EQUIPMENT COMPONENT			
4100	Expendable Equipment			
4101	PCB oil test kits	\$ 500		20 @ \$25 each
4200	Non-expendable Equipment			
4201	Oil collection tanks, Fiji		\$ 57,100	supplied by Fletcher Steel
50	MISCELLANEOUS COMPONENT			
5200	Reporting Costs			
5201	PPA publication and dissemination of of Power Stn handbook		\$ 5,000	
	SPREP publication and dissemination of 2 other handbooks		\$ 10,000	
	TOTAL COSTS	\$ 690,400	\$ 626,100	

Appendix 1: Terms of Reference

Provision of Services as an Organic Waste and Waste Oil Strategy Enhancement Consultant (UNEP/GEF Project)

Objectives

Provision of a report (which includes a costed and time-bound activity plan), that identifies gaps in existing organic waste and waste oil management approaches and strategies which could be addressed through the implementation of the GEF Project.

Scope of Work

The consultant will:

Review available information and previous work done by AFD, SPREP, JICA and other agencies in order to identify gaps in existing organic waste and waste oil management approaches and strategies which could be addressed through the implementation of the collaborative GEF Project. Gaps may include, but not be limited to strategic guidance, regulatory frameworks, infrastructure and/or enhancement of technical skill sets.

Tasks to be performed

The consultant will:

- a) Review available information and previous work done by AFD, SPREP, JICA and other agencies in order to identify gaps in existing organic waste and waste oil management approaches and strategies which could be addressed through the implementation of the Project. Collaborate with the French Development Agency (AFD) to align GEF activities with relevant AFD activities;
- b) Actively participate in a final stakeholder consultation workshop with participating countries and partners at a date to be advised.
- c) Complete a report which includes a costed and time-bound activity plan for this component of the work, which will be an input into the draft framework work plan for the GEF Project Document.

Deliverables

Complete a costed and time-bound activity plan for organic waste and waste oil management approaches and strategies for the Pacific region for the GEF project plan in the specified format.

Timeframes

A costed and time-bound activity plan for organic waste and waste oil management approaches and strategies for the Pacific region to be completed within 12 weeks of signature of this agreement.