

CHALLENGES IN HAZARDOUS WASTE MANAGEMENT IN THE SOUTH PACIFIC

Dr Margaret Leonard, Golder Associates (NZ) Ltd

Allan Boase, Inga Doak Golder Associates (Pty) Ltd

ABSTRACT

Effective hazardous waste management is a problem affecting all countries. In countries such as the Pacific islands, resources are limited and effective management is critical. This is similar to some of the problems faced by smaller councils in New Zealand. Workshops on effective management of hazardous materials were held in Pacific Island Countries early this year as part of South Pacific Regional Environmental Programme for Pollution Prevention. The outcome of the workshop was to form action plans for individual islands with recommendations for government. Another important function of the workshop was for countries to learn from each other what was effective and what was not. In this paper effective and ineffective methods for managing hazardous waste are presented. At government level the framework for control of hazardous materials has an important impact on the effectiveness- this includes legislation the department responsible for Environmental Services, user-pay systems, education and poorly defined responsibilities for environmental issues, especially hazardous waste. At operational level some effective systems were being carried out for pesticide management including documentation and training for farmers. Education programmes had generated interest resulting in organisation of collection systems. Continuing to harness this enthusiasm remains a challenge. Collection services had been set up through people's own initiative, such as returning used oil to suppliers, but planning was important to ensure that collected items can be disposed of and do not create a stockpile problem. This paper discusses these issues and presents a summary of effective and ineffective methods of hazardous materials management identified.

1.0 INTRODUCTION

Every four years an action plan is produced by the South Pacific Regional Environmental Programme (SPREP) to manage the environment of the Pacific. Pollution prevention has been targeted as a key result area and a programme to increase the capability of SPREP members to manage and respond to hazardous waste is one of the key objectives. As part of this programme, a series of workshops managing hazardous substances were run in 13 member Pacific Island Countries (PIC) between December 2000 and March 2001. Participants from government and private industry were encouraged. Summary reports from each country is able to be viewed on www.hazchems.com and Action Plans should be posted soon. This paper reviews the issues of major concern to PIC and presents effective and ineffective methods of managing hazardous substances, based on the responses of the workshop participants. It is based on my experiences and does not reflect the views of SPREP, individuals or governments.

2.0 BACKGROUND

In PIC there is often no Health and Safety legislation, so management of hazardous waste is even more challenging, because it is likely that chemicals have been incorrectly stored, containers are in bad condition, labels are illegible, or chemicals are not be labelled at all. In recent years direct importation by governments of large quantities of potentially hazardous chemicals has generally ceased, so stockpiles tend to be of older chemicals. Private purchases of chemicals may be controlled in countries where importation is from New Zealand or Australia. In these cases the controls of these countries are indirectly applied eg Cook Islands, Niue. Quantities of hazardous waste are also generally known, owing to the small size of the communities and the information obtained in a very thorough study has been undertaken by SPREP to identify and quantify stockpiles of hazardous waste and contaminated sites.

The SPREP report identified that the most common hazardous wastes stockpiled were pesticides with timber treatment chemical sludge and hydrocarbon being the most common contaminated sites. In addition to stockpiles of old chemicals, there is the on-going problem of managing hazardous waste generated from industry, electricity supply and farming.

There are limited options for disposal of stockpiles of hazardous waste or chemicals on a Pacific Island. High cost technologies such as high temperature incineration or plasma arc are even more unlikely in PIC than in New Zealand. Practically the more likely options are:

- Chemical/physical treatment,
- Co-disposal at local landfill,
- Recycle,
- Bioremediation,
- Off island disposal.

2.1 Chemical/Physical Treatment

This technology is currently used in some PIC. Timber treatment sludges can be encapsulated with cement and buried and battery acid neutralised with alkali in a 200 litre drum. The technology is simple, the resources generally available, the costs low and the treatment effective.

2.2 Landfills

Landfills were identified in the country reports as a major issue and are discussed in detail below.

2.3 Bioremediation

In the warmth of the tropics, bioremediation is a viable treatment, especially for sites with low levels of hydrocarbon contamination. It can be set up as a low cost and simple technology using readily available equipment (bulldozer to collect the material, concrete pad for mixing, sump for collecting runoff, manure for seeding and nutrients, person to check moisture content and turn the material). Water, warmth, space and time are generally in

good supply. An olfactory measurement would be the primary indication of the progress of the degradation process for oil. If funds were available a chemical test would confirm degradation was complete. The key to this approach is to know the likely composition of the contamination ie how likely is it for PAH or PCB to be present and in what quantity and to use the remediated soil in a precautionary way ie don't grow vegetables in it. This may also work for small quantities of the stockpiles of chemicals. Field demonstrations of bioremediation using local materials were given as part of the workshop.

2.4 Off Island Disposal

The option of "Off island disposal" generates many more issues such as:

- Storage of chemicals while waiting for transport off the island
- Logistics of organising transportation of hazardous waste around the islands
- Funding
- Lead in time for organising such an large programme
- Identification of a receiver
- International conventions and treaties eg Basel Convention (1989) on the Control of Transboundary Movement of Hazardous Wastes and their Disposal or the local equivalent, the Waigani Convention (1995) to Ban the Importation Into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region. The Waigani Convention is not yet in force, as it required ratification by four more countries. Ratification imposes responsibilities on countries to show they comply with the intent of the Convention. For example for transboundary shipment of hazardous wastes it would be necessary to have in place a system to demonstrate that the wastes have been accurately identified are stored safely for movement. Development of such systems requires a government to commit resources and finances.

3.0 KEY ISSUES

Review of the summary reports from the workshops indicated that following were the major country issues with an indication of how many countries reported them.

1. Regulatory Framework 85%

- Legislation and assigning responsibility 38%
 - Environmental 23%
 - H&S 23%
- Enforcement 15%
- Controls 31%
- Integration of services 31%
- Signing Waigani or Basel convention 23%

2. Management of hazardous chemicals

- Central location, government purchasing, segregation and storage, labelling 38%
- Codes of Practice 23%

3. Training

- Health and Safety 54%
- Hazardous waste 8%
- Equipment 23%

4. Waste management

- Landfill 46%
- Improvement 23%
- Recycling 23%
- Register of contaminated land stockpiles 15%
- Site management plans 15%
- Review of options for island/off island

5. Funding 23%

6. Education

- Public 61%
- Technical 15%

7. Specific contaminated sites 23%

8. Infrastructure other than landfills 23%

As can be seen from above the three key areas common to most countries were:

1. Regulatory framework
2. Training in management of hazardous chemicals
3. Improving landfilling facilities
4. Education.

These are discussed in more detail below.

3.1 Regulatory Framework

Having a suitable framework to control hazardous substances and hazardous waste was identified as the key issue. Many countries have a raft of legislation which touches on environmental issues, often with draft legislation pending which attempts to focus on environmental issues. In Tonga for example, under current legislation, some environmental issues could be dealt with under the functions of the Health department.

All but two countries indicated that legislation either needed to be drafted, updated and/or enforced. As can be seen from above the areas of concern varied from country to country depending on systems and legislation was already in place. The need to clearly define responsibilities and to liaise between departments was also important as management of hazardous waste covers many areas and consequently many departments :- environmental, public health, infrastructure, land.

3.2 Landfills

General improvement of waste management in general and landfill operation in particular was seen as being a priority (43%). Co-disposal of hazardous waste is the current method of disposal and is likely to be so for the foreseeable future. As was the case in many small New Zealand towns, at landfills with no control on tipping, the types and quantities of waste are not known and burning of waste appears to be a common practice. Use of landfills is likely to increase where traditional waste minimisation practices such as composting organic waste or and feeding it to the pigs decreases or is prohibited (in certain areas composting is banned as it attracts pests).

The importance of modern landfill management is critical and most countries are looking at developing new landfills, or in the process of doing so. Ideal sites and materials such as clay for capping are not easy to find, if indeed they exist. A coral atoll has very little soil, let alone a suitable clay for lining a landfill. However, by improvising and looking at the fundamental requirements some appropriate solutions were observed. Coral can be crushed very finely and compacted to form a good impervious surface. This is more appropriate than trying to import clay, or use a geomembrane both of which would be prohibitively expensive.

4.0 EFFECTIVE MANAGEMENT

4.1 Codes of Practice and Guidelines

In the islands where there is significant industry, codes of practice or guidelines were discussed as a more effective method than legislation in achieving beneficial outcomes. Legislation is seen as:

- Taking a long time to introduce,
- A top down and authoritative approach, rather than a co-operative approach,
- It needs to be monitored and enforced in order to be effective.

Benefits from Codes of Practices or Guidelines include:

- Networking between people in the different industries, sharing information and experiences.
- Buy in from the industries involved (compared to a legislative approach which is imposed on them),
- Raising environmental awareness in general,
- The opportunity to examine work practices in the light of environmental and health and safety issues.

Some industries such as the oil industry already have strict procedures for handling potentially hazardous materials. For other industries codes of practice in other countries such as Australia and New Zealand could be adapted by the local industry, maximising use of the available information and pitching it at the level appropriate for PIC.

In countries with small populations, there are simply too few people to undertake the work required. Most people have responsibilities in several areas, requiring a high level of general

knowledge on disparate topics. Solutions which require enforcement and monitoring are less likely to work, than this type of cooperative solution where industry “policing” itself.

4.2 Recycling

Recycling programmes were already underway, enthusiastically started, and supported by industry and the public. Battery collection was commonly undertaken. With a couple of 220 litre drums and caustic soda the batteries could be drained and stored on concrete pads. Continuous pick up service for household appliances worked well. In at least one country, rather than have only one window of opportunity to put out car batteries, or household appliances, people were encouraged to use the service as needed.

Difficulties arose when it came to removing or using the material collected. Transporting small quantities waste is not economically viable. One optimistic proposal was to negotiate with the shipping companies to take material, as a goodwill gesture. Can crushers and paper shredders were in use on some of the islands, but the issue remained of what to do with the material. In rare instances the cost of shipping was believed to be recoverable eg lead from batteries, but it hadn't been implemented. There were other indirect benefits as the local rugby club in Tonga used collection of the bins as part of their weekly training regime, encouraging good local spirit and raising awareness at the same time.

However, separation of waste streams has the benefit of reducing the amount of material going into landfills. As landfills were the most likely repository for hazardous waste either after encapsulation or using co-disposal, the recycling activities had an less direct value.

4.3 Landfill Management

A well managed and presented landfill site can be a great source of encouragement for those using it. At one location a remarkable improvement in the operation of the landfill was reported through routine compaction and covering of waste, keeping the gateway clear and clean and having clearly identified areas for separation of waste worked well. Use of the local bulldozer, might therefore provide the best value for money for handling waste because of the flow on effects.

4.4 Site Management Plans

Management and spill response plans do not take a lot of financial resources and are an effective preventative and response measure. A plan for each site where hazardous chemicals were stored or used was achievable for the participants and examples prepared in the workshops. At present these are most commonly observed at oil depots, but were enthusiastically supported by participants.

4.5 Education

Training was identified by 61% of the PIC as being important, both in handling hazardous chemicals and in managing hazardous waste. The workshops went into detail on these aspects. By providing participants with knowledge about chemical labelling, MSDS, storage and handling, chemical storage could be significantly improved at a comparatively low cost.

Adoption of these practices would significantly reduce the risk to the health and safety of workers, as well as the potential for contaminated land through accidental spills, or fire.

Locally airport fire services had the best resources and knowledge of hazardous chemicals. Identification of people with the knowledge was a useful outcome for participants from the workshop. As is often the case, knowledge is a key tool for improving hazardous waste management. Usually the sites with the best hazardous chemical management and contingency plans were the oil companies. Participants which visited these sites could see in practice how simple but effective the plans could be.

In some PIC there was extensive involvement by the Ministry of Agriculture (or similar) with farmers, providing education in use of herbicides and pesticides for effective farming. Field days are held regularly and this was identified as providing an ideal opportunity to extend the content to include hazardous materials management.

Raising the awareness of the general public was also identified as a key component to the long term success of hazardous waste management. Firstly by educating people about the effects of the use of hazardous materials and secondly because people realised that if you didn't use it, it wouldn't be a problem. Seeking alternatives at the purchasing end has long term benefits. Many countries no longer treat timber, as it is imported treated as required. Careful use of hazardous materials, so that spills didn't occur was also identified as being a long term goal.

4.6 Negotiation

If long term environmental outcomes were considered during negotiation of contracts for supplies, it was believed that recycling or removal of waste off the island could be incorporated. Most islands generate electricity in diesel operated plants and waste oil was often a problem. Some success was reported where removal of the waste oil was tied into the supply contract.

This approach could be entered into at all levels of materials procurement as a tool for waste management.

4.7 Adapt successful systems

By modifying existing systems, introduction and control of hazardous substances in general could be achieved. Pesticides and herbicides have been in use over a long period of time as the hazards to health and to the environment had been recognised earlier. A great wealth of knowledge has been accumulated by the people working in this area and familiarity with systems makes wider application easier than introducing a new system. Again, the workshop was a forum for participants to learn what skills existed within the community. Often people in other departments and industry were not to be aware of this experience.

5.0 INEFFECTIVE MANAGEMENT

The most common ineffective management systems for hazardous material were identified as the most things that required funding to implement and operate, or complicated

procedures. Awareness of local culture and conditions was critical for effective systems. For example, the draft environmental bill in Tonga did not reflect the traditional Tongan relationship between land and ownership and therefore is unlikely to be passed into legislation until this key relationship is reflected in the Bill. With limited lines of materials imported into the country Personal Protection Equipment may not always be ideal, but improvisation is better than nothing. Wearing PPE in the heat of the tropics requires awareness of problems such as overheating.

I observed that “User Pays” was not very effective for managing waste collection. Charging for use of the domestic collection system had led to illegal dumping in some countries. This created additional problems from infilling mangrove swamps (an ideal illegal dumping ground) and a health hazard by providing an ideal breeding ground for pests.

Some internal matters were:

- Workshop overload,
- Poor dissemination of information after someone has been overseas on a course/workshop,
- Delegates to courses not necessarily working in the area.

Donations of equipment from aid programmes or NGO can be non-beneficial if they are difficult to maintain, complicated to work, require a high level of expertise to operate and counter-productive if they don't address basic needs. Some classic mistakes are made eg a sheep's foot roller that required machinery to pull it that wasn't available on the island. While it may have given better compaction on the coral substrate, who's going to fund the equipment to pull it? Something heavy that can be driven over the landfill, such as the local bulldozer is far more beneficial. Asking operators what they need, rather than supplying what an outsider thinks they need is a valuable lesson which still needs to be learned. People become rather cynical about this sort of mismatch.

6.0 SUMMARY

The most effective management practices require raising the level of awareness of people in industry and government in order to incorporate better environmental practices into the routines of the workplace, such as:

- Codes of Practice or guidelines which would include chemical handling practices,
- Recycling materials as part of purchase agreements,
- Site management and contingency plans,
- Building on successful systems and in-house knowledge in place.

These approaches maximise existing resources, in terms of knowledge, personnel and finances, do not depend on legislation and, most importantly are likely to produce results.

Awareness programmes for the general public were also seen as vital to minimise future impacts of hazardous waste, minimise the potential for site contamination and improve current practices (eg stop burning at landfills, to encourage recycling).

Ineffective methods of managing hazardous waste were those that:

- involved obtaining funds, or requiring people to pay for a service,
- required resources such as personnel for enforcement,

- applied systems used overseas without taking into account the local culture or sensitivities of people, as in legislation,
- providing equipment that doesn't work, or requires more investment in equipment, or is complicated or expensive to operate.

The challenges facing PIC are:

- to improve the operation and management of existing and future sites,
- implement simple, but effective low cost solutions which minimise generation of hazardous waste and contaminated land,
- continue to harness the enthusiasm of the people participating in these schemes and utilising lateral thinking to use the resources available to find solutions.

ACKNOWLEDGMENTS

I would like to thank the participants in the workshops for their enthusiasm and participation and SPREP for the information provided and facilities. My thanks also to the Golder's staff who shared the experiences they had in other PIC.