

**Secretariat of the Pacific Regional
Environment Programme**

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**Guideline on
Waste Minimisation
for Atolls and Small Islands**

***‘Choosing
the right policy
for your situation’***

This guideline is designed to compliment SPREP’s “Rubbish is a Resource” waste resource kit. It will assist you in deciding which policy directions are available and suitable for your country. The “Rubbish is a Resource” will then provide detailed information on the practicalities of implementing the policy.

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Why is waste minimisation important?

Atolls and the many small islands that abound in the Pacific, do not have the luxury of cheap landfill.

- Lack of space
 - Vulnerability to storm surges
 - No soil to cover or seal the wastes, and
 - Reef and lagoon ecosystems that are sensitive to any extra nutrients or contamination
- all these combine to make landfilling extremely difficult.

Disposal by incineration instead has some major disadvantages. The air pollution risks are usually not as high (as they are on continents), thanks to the large expanses of surrounding ocean. Yet the high costs and challenging technological safety demands of incineration tend to make it an inappropriate disposal solution. Improvements in gasification systems and energy recovery could alter this balance over the next few decades. However, the prospect of turning the mountains of plastic residues into an energy source are likely to remain a fantasy in the foreseeable future.

Waste issues are causing problems the world over because of a combination of factors:

- Disposal is extremely expensive
- Imported goods have significant packaging residues
- There are minimal recycling or re-manufacturing opportunities, and
- Economic bases are usually very narrow and inadequate.

In many places, this is exacerbated by rapid population migration to country capitals with the associated erosion of traditional governance, strained infrastructure and services, and development of squatter settlements outside of land tenure-based taxation. This powerful, negative mix has no easy, cheap or quick solutions. But some simple policy tools can be used to reduce this problem. With good planning, those policy tools can assist with developing jobs and economic solutions and this Guide will help you identify the best choices.

The absence of easy disposal options has some profound implications for waste management. Waste minimization is always a more environmentally desirable option over disposal; but on atolls and small islands, it is truly essential. Accordingly, this guideline explores the many ways by which governments can reduce waste and make use of the inherent resources found in the waste streams.

This guide attempts to consolidate best-practice policy suggestions and real-life examples: these show what's possible and may assist with reducing the impacts of these growing problems. It is designed for government, community and private sector decision-makers and complements the practical hands-on implementation guide found in "Waste is a Resource"- the SPREP Waste Kit - http://www.sprep.org/solid_waste/index.asp. While the primary audience is for atolls and low islands because of their particular vulnerability, much of this guide is equally applicable on the larger land masses of the Pacific.

Waste Minimisation – General Government Policy Options

Communications

Almost all waste minimization initiatives require a sound communications programme. Whether it is consulting with business and the public about a new import charge, detailing a deposit and refund scheme, or trying to change behaviour – well targeted communications will be a large part of your success or failure. You need to determine who you are aiming at...businesses, women, who? SPREP has developed a guideline for developing a communications strategy and that will be available on the SPREP website.

The most important aspect of this is to ensure you have developed and budgeted for your communications at the beginning of the project. Too often the need to pay for communications is forgotten until the project is underway and funds have to be scraped together from other allocations. Communications is a vital and integral part of any good minimization strategy and needs to be included from Day 1.

Voluntary Agreements

Regulation can provide a “level playing field” for business and a clear set of rules. Unfortunately, regulation can cost a lot of money to enforce. In the Pacific, enforcement can also raise complicating social issues when relatives, kustom or wantok systems are in conflict. By contrast, voluntary agreements with business tend to sit more easily with the consensus style of governance used in many Pacific cultures.

Crab Bay, Vanuatu

Over the last 25 years, the villages on Crab Bay on Malekula had seen their land crab population plummet and the price has risen by ten times in the last three years.

Unsustainable harvesting was also damaging the breeding areas in the mangroves.

While there is legislation covering fisheries, it tends to apply to commercial species and arrangements, not to the traditional subsistence fisheries used by 70% of the population.

Rather than use legislation (which the government could not afford to police anyway), a strong community consultation program helped the villagers agree to limit their rate of collection of the land crabs.

Now the populations are on the increase once more.

Voluntary agreements with the private sector can be very useful and productive, especially if backed with clear performance targets and a strong commitment by government to institute regulatory action if targets aren't met. Voluntary agreements can be more quickly instituted than legislation and remain more flexible.

Just as importantly, they can cost government less while gaining more support from the private sector: businesses often know better how to change a product, its use or its consequences. Because voluntary agreements are not law, they do not violate any trade agreements and so can be a flexible way of improving the impact of dangerous products. The private sector can often incorporate advertising at the same time to get a commercial return on the effort.

Voluntary agreements still need formal documentation and the assent of all the major companies involved. For example, it may be decided that your country wishes to change from non-biodegradable plastic bags to biodegradable shopping bags. A voluntary agreement with the importers may be sufficient to achieve this. The importers still make the same profit from the new bags and may just ask for enough time to clear old stock and source new stock from overseas. The agreement could simply say that the government will check compliance in 6 months and impose legislation if non-biodegradable bags are still being imported.

Voluntary agreements can also be used for developing programmes to reduce negative impact. For example, you may have a problem with disposable nappies (diapers) ending up in lagoons or being spread around by dogs. An agreement with the importers and retailers could be that they fund a public education programme to tell the users how to safely dispose of soiled nappies. If the programme is successful, the problem has been solved without any cost to the government. If the programme proves unsuccessful, the government can then go to regulation.

Plastic bottles in South Australia

South Australia has had a successful deposit and refund scheme on glass bottles for many years. You pay a few cents extra for your drink and then can get most of the deposit back from a depot. Then drink manufacturers were moving to plastic because it was cheaper.

Glass bottle manufacturers complained that they were disadvantaged by price yet the plastic bottles were becoming a major litter problem. The government agreed and approached the plastic bottle manufacturers. The plastic bottle manufacturers said that they could solve the problem voluntarily without all the costs and regulations involved in establishing a deposit / refund scheme.

The government gave the plastics manufacturers 12 months to reduce the amount of litter by a certain percentage. The manufacturers ran a public education programme and set up places where you could recycle your plastic bottles. But after one year, the government measured the amount of plastic bottle litter and found that there had been hardly any improvement. Then they passed laws requiring a deposit on plastic bottles.

Draft policy

"The government will work with the private sector to find the most cost-effective way to reduce the impacts of various goods and services. This may include voluntary agreements with clear targets for both government and the private sector and a policy alternative if the voluntary agreement does not achieve its agreed targets."

Implementation:

- ↓ Determine what the impact is that you wish to see reduced, for example fewer plastic bags in the sea;
- ↓ As voluntary agreements are less certain in their outcomes, is that an acceptable option for this impact?
- ↓ What would the government have to pay to regulate and how long would this take?
- ↓ Will the all the private sector players be willing to change their behaviour voluntarily?

- ↓ Map out the regulatory system that you would use as an alternative, if the voluntary system doesn't get support or doesn't work;
- ↓ Now determine whether the impact that you want reduced can be best done by voluntary or regulatory methods;
- ↓ Negotiate an agreement with the private sector;
- ↓ Develop a communications strategy to inform the public and private sector;
- ↓ Brief the Minister about outcomes and sign the agreement;
- ↓ Put your communications strategy into effect and monitor progress.

Bans

The cheapest and easiest way to deal with an atoll's waste problem is to stop it before it arrives. This can be done through outright bans on material that is thought to be sufficiently damaging or difficult to deal with. Samoa has taken this course by banning non-biodegradable lightweight plastic bags, and some places in Tokelau have banned disposable nappies (diapers).

Bans need strong community consultation, as they are likely to cause some concerns from both the consumers and the businesses that sell the goods. PNG attempted to ban plastic bags but the local manufacturers successfully argued that it was unduly harsh on their businesses. The ban was overturned.

Choosing what can be banned without significant public or political backlash is very important. Disposable nappies are a case in point. Unless there is a simple and convenient alternative, mothers will be angry. Also, the water consumption of washing cotton nappies has a significant environmental impact for water-constrained atolls and small islands. In this instance, banning disposable nappies may not be in the best interests of the environment as a whole.

Bans need legislation, but a country's import regulation may already provide the legal power. In practice, bans are relatively easy and cheap to implement, as all countries have existing controls on imports with established infrastructure and personnel. You need to consult with Customs about their view on how best to implement. As the inspection and control is at the point of entry, there is usually no need to monitor shops unless a significant "black market" emerges.

Samoa bans plastic bags

Samoa recognized that plastic bag litter was costing them money in health costs from increased mosquito breeding, the accompanying Dengue and Filariasis diseases, reducing tourism growth, exacerbating flooding, and killing marine animals.

By switching to bags that break down in less than 6 months, they believe that most of the problems will be solved.

Import licenses are required to bring in any plastic bags in bulk; such licenses will only be granted for 50% corn starch plastic bags or specialist bags like clip-lok or heavy-weight bags.

While the bio-degradable bags are more expensive, bags are so cheap anyway there is no noticeable cost increase at the checkout. Samoa does not manufacture plastic bags so there were no local employment or investment issues .

Draft Policy:

"In keeping with the recognized principles of 'Polluter pays', the 'precautionary principle' and the 'waste hierarchy', the government will, as far as is sensible and is consistent with other national priorities, prevent the importation or production of goods or services that have a negative impact on our environment or economy far in excess of the product's or services' positive benefits."

Implementation:

- ↓ Document the negative impacts of the suspect product or service;
- ↓ Brief Minister on proposed action including costs of regulation (how many new inspectors are needed, etc.) and specific benefits that can be expected;
- ↓ Commence consultation with stakeholders – manufacturers, importers, retailers, users – and particularly those who suffer the negative impacts most, for example Local Government having to clean up plastic bags;
- ↓ Determine whether a strict licensing arrangement with conditions would be better than a complete ban;
- ↓ Document all aspects of preferred strategy – this will be very useful guidance in drafting implementing legislation;
- ↓ Get legal advice as to whether existing laws can be used to implement preferred strategy;
- ↓ Brief Minister and/or Cabinet on proposed implementation;
- ↓ If existing laws cannot be used, draft new legislation or regulations to cover proposed items;
- ↓ If legislation is proposed, ensure that the “head of power” is wide: then the products or services can be specified from time to time under more detailed subsidiary regulations;
- ↓ Consult with the stakeholders on legislation;
- ↓ Determine whether a delay in commencement date is required to allow existing stock to clear or contracts to be completed;
- ↓ Develop a communications strategy to inform the public and private sector.

Taxation

Governments around the world have used taxation as a valuable tool in reducing waste: taxation reduces demand by increasing prices. The Irish Government famously reduced lightweight HDPE plastic (checkout) bags by 90% in the first 6 months by applying a per bag levy equivalent to US20c. Not only did they reduce the number of bags and their associated negative costs of litter, public health and tourism discouragement they also raised significant sums for the government, which were used for environmental management.

Taxation has the advantage of allowing for differential taxes. For example, some bags are more problematic than others and can have a different tax. Taxes also can be gradually increased to reduce the economic impact on local importers or manufacturers. It can also be used to influence consumer choice by making one particular product or packaging less desirable. Some countries have tried to reduce the use of disposable nappies (diapers) by placing a levy on them to pay for their management. Analysis indicates that the product demand is very strong and very little drop in consumption has occurred. However, the government now has a source of funds to pay for educating the public on safe disposal.

Draft Policy:

"When appropriate and consistent with other Government priorities, this government will use taxation to ensure that the environmental costs of a product or service are recovered and used to mitigate the negative consequences of that product or service. This will ensure that the market price reflects not only the costs of production but also the costs of safe recycling or disposal."

Kiribati changes from bottles to cans

Kiribati had a problem with empty beer bottles. Although recyclable, the empty bottles were very expensive, difficult to ship and cost too much to make recycling profitable. As well, many broke and the glass was causing cut feet, particularly in children, as well as discouraging tourists.

The government simply increased the import duty on glass bottles so that beer drinkers chose the cheaper beer packaged in aluminium cans, and importers stopped importing bottles beer. The cans can be recycled easily and don't have the same public health costs.

Implementation:

- ⇓ Determine which products or services require additional taxation to either discourage their consumption, or to incorporate the costs of government clean-up;
- ⇓ Establish the best place (retail or wholesale or import) to levy the tax, who will collect it, and how to ensure the funds are spent on the intended purpose;
- ⇓ Determine the level of taxation to either deliver the funds required, or to discourage excessive consumption;
- ⇓ Consult with government central financial / budgetary agency about the proposed arrangements and the costs of administering the scheme;
- ⇓ Consult with stakeholders (i.e.

retailers, big-volume consumers, importers);

- ⇓ Document all aspects of preferred strategy – this will be very useful guidance in drafting implementing legislation;
- ⇓ Get legal advice as to whether existing laws can be used to implement preferred strategy;
- ⇓ Brief Minister and/or Cabinet on proposed implementation;
- ⇓ If existing laws cannot be used, draft new legislation or regulations to cover proposed items;
- ⇓ If legislation is proposed, ensure that the 'head of power' is wide: then the products or services can be specified from time to time under more detailed subsidiary regulations;
- ⇓ Consult with the stakeholders on legislation;
- ⇓ Determine whether a delay in commencement date is required to allow existing stock to clear or contracts to be completed;
- ⇓ Develop a communications strategy to inform the public and private sector.

Deposit and Refund Systems

Deposit and refund schemes have proved successful in many places in the Pacific for encouraging the return of materials by the public. They involve a small levy being paid on

purchase; the money (minus the costs of the scheme's administration etc.) being refunded when the materials are returned to the designated place. Beer bottles are a familiar and successful example, but the same principle can be used for many items. Cars need to be returned before they can't roll anymore – otherwise they need cranes or other expensive heavy machinery to manipulate them. A simple deposit paid on entry to the country can be used to get them returned for a refund at a central point, where they can be separated into parts for export and recycling. Just as importantly, a percentage of the deposit can be retained to cover the costs of exporting the car bodies and for the disposal of the unrecyclable components.

Thus, a deposit / refund scheme can facilitate the consolidation of recyclables to a depot without any expansive collection costs, reduce waste disposal costs, influence consumption patterns, and provide funds to pay for the recycling or disposal of the item involved.

The system can also assist in economic development if run by the private sector and is best operated by someone experienced with the import and export system. It may be advisable to begin the scheme using the government and then put it out to tender when the system is running well. Alternatively, there may be an existing aluminium can recycler who would be an appropriate operator for other materials from the beginning.

You will have to decide how to handle future expansion into less and less valuable materials. Aluminium cans generate more money than they cost, but almost all other materials require subsidies. A private sector operator will only wish to handle the most profitable materials whereas the most environmentally damaging ones need to be gathered also.

Contracts need a fair and flexible mechanism to enable government to expand the materials yet pay a fair price to the operator. This can be handled through an “operator's cost plus agreed profit margin” clause, which will provide for new and possibly unforeseen materials. Your system must be financially sustainable or it will fail over the longer term.

Deposits and refunds are a proven and very cost-effective way to minimize waste but they do have practical issues. A major issue that has emerged in some countries is ensuring the government doesn't use the deposits for other purposes. If they do, there is no money to pay the refunds and the public gets very angry. Thus, deposits need to go into a “safe” central account that is only used for either the refunds or paying the costs of the waste system. The money also needs to be moved quickly to the operator of the refund depot, otherwise a cashflow problem can disrupt the business.

Kiribati funds recycling with deposit / refund scheme

Kiribati has introduced a deposit / refund scheme on aluminium cans, plastic bottles and car batteries. A small deposit is paid on purchase and 80% of this is re-paid when the materials are returned to privately operated depots. Government provides the operator with the money to pay the refund, and the balance is used for any subsidies needed to pay for exporting the items for overseas recycling.

This scheme means Kiribati has less waste going into its expensive landfill, less litter around, a source of income for children and unemployed, a significant small business, and less toxic waste from car batteries: all this at NO cost to the government. More details in “Waste is a Resource”- SPREP Waste Kit (www.sprep.org/solid_waste.)

Draft Policy

"Consumers will be encouraged to return appropriate recyclable or dangerous wastes by using a deposit / refund scheme. The government will ensure that the deposits paid are put into a dedicated fund to ensure money is available for refunds. The deposit will be determined by the money needed to motivate return of the goods, the costs of recycling or disposing, and the costs of administering the system."

Implementation:

- ↓ Determine which materials are best to begin the deposit / refund system: aluminium cans, glass and plastic bottles are relatively simple and well understood. Once established, the system can be expanded to cover difficult wastes such as car bodies or hazardous wastes like lead acid batteries.
- ↓ Research the volumes, costs and experiences elsewhere (Existing schemes have developed lots of practical hints.. There is also good practical advice in the "Waste is a Resource"- the SPREP Waste Kit - www.sprep.org/solid_waste).
- ↓ Decide the level of deposit to cover the costs of the scheme, the money needed to subsidise the recycling or disposal, and sufficient incentive to encourage most of the target goods to be returned e.g. 5 cents deposit on each aluminium can = 4 cents for the refund and 1 cent to administer and subsidise the system. Pick simple whole numbers as the refunds will need to be paid in cash e.g. in Kiribati, a 4 cent refund becomes a refund of 20 cents for 5 cans.
- ↓ Identify how the government may best recover the deposit, for example on import, wholesale or retail.
- ↓ Decide where the refunds will be paid. While using the shops that sell the goods is traditional, it has been found that specific depots can make it easier to expand the system later. Depots will need some security to prevent the theft of the goods to get a second refund.
- ↓ Decide whether government or private business will operate the system and how you are going to decide on the appropriate operator (tender criteria, existing experience, etc.). It always good to get someone who has some experience with running an import / export business because that is essentially what it becomes.
- ↓ Document your proposed system (implications for government, costs and benefits, impact on public, waste outcomes etc.).
- ↓ Consult with Treasury / central finance as to how best to collect deposits and how to ensure funds are safe-guarded for use as refunds.
- ↓ Consult with the retailers and importers about the proposed system.
- ↓ Brief minister or cabinet about system and gain approval.
- ↓ Get legal advice as to whether specific legislation will be necessary to enable the system; brief counsel if legislation is necessary.

A Bad Experience

One Pacific country set up a deposit / refund scheme but then used the deposits that had accumulated in the bank account to fund other government activities. When the public came to claim their deposits back, there was no money in the account to pay. The system collapsed, and now the public are not supportive of any recycling. This has done long-term damage to waste management on the island.

- ↓ Work through specific details with local operators (depots, refund re-payments, export issues, cross-subsidies from viable materials like aluminium cans to plastics which do not recover their costs).

Waste Minimisation Techniques for Specific Materials

Glass

Glass is one of the few materials that are simple and easy to recycle, if your country has its own glass manufacturing plant / furnace. Some glass bottles are still made sufficiently strong to allow for re-use after washing and sterilizing; these often have systems for return and re-use, for example beer bottles in some countries. However, many bottles are now so thin that they break easily in collection and transit. Broken pieces are difficult and expensive to sort and make recycling less viable.

Another growing trend will influence your decisions on glass: the replacement of glass containers by plastic ones. While this has many advantages as a cheaper and stronger packaging, it means that glass volumes will reduce over the next ten years and plastic will increase.

The main challenge is to reduce the impact of used glass containers. As glass is inert, the main issue is avoiding the broken glass that causes cut feet and reduces tourism, both of which can cost the country dearly. To achieve that outcome, a system is required to encourage the public to deliver the bottles or other glass back to a central depot. Deposit / refund schemes offer the simplest way of both providing an incentive for the public, and also provide extra money for the disposal. Other ways can be simply to pay the public by weight of bottles delivered; or even use a public awareness campaign to encourage the right behaviour.

Crushed glass can be used as inert fill in lagoons (one of the few substances that can safely be used for that purpose), as substitute for aggregate or coral in low-stress concrete, and even as a decoration. This is usually the most cost-effective and environmentally responsible option for atolls and low islands. See practical advice in “Waste is a Resource”- the SPREP Waste Kit - www.sprep.org/solid_waste.

Plastics

Plastic containers are rapidly replacing many of the other packaging materials, and plastic sheet is increasingly being used to secure items with shrink-wrap and other film-based covers. Plastic is waterproof and hardy hence can be extremely useful for life on atolls. so banning all plastic is not a sensible solution except for some types that cause particular problems - such as disposable polystyrene foam or non-biodegradable bags.

The very light weight of bags makes them particularly visible as they float or are blown around by the wind. Their long life means they can stay visible for many, many decades, if not longer.

The disposal of plastics is difficult. They consume large volumes in transport or the landfill airspace (the unused capacity of a landfill, and the measure of how much life it has left before being full) and so are very costly per tonne to manage. An added complication is that plastics cannot be dumped at sea, like some other waste streams. So the choices are: to subsidise

plastic recycling, or dump it into what little landfill you have. Plastics are difficult to compact in a landfill and so waste costly airspace. While the problem is that plastics are very stable, they may have some breakdown products that are environmentally damaging as well.

Incineration of plastics is possible, but it is very expensive to do it safely. The combination of high temperatures, high humidity and marine air are not kind to these systems. High-temperature incinerators are notoriously temperamental and often need major repairs or replacement. Low temperature burning, including setting the dump site on fire, is practised on many atolls and rural areas throughout the world. While this reduces the vermin and volumes of waste, it is important to remember that the smoke is toxic. So plastics should never be burnt when the wind direction means there is a chance of people or animals inhaling the fumes. The burnt residue also contains toxic products and can contaminate soil, ground water and possibly affect an adjacent lagoon.

The best choice is to recycle plastic, but this will be expensive. Unfortunately, no plastics are currently viable to recycle in the Pacific without some external subsidies.

You can reduce the costs of plastic recycling in a number of ways. Like for glass, a container deposit / refund scheme not only ensures that collection is done for free, the deposit can also be used to pay for some or all of the recycling costs.

Because plastic is so light, compression is essential to export. Shredding, compressing and baling are important (www.sprep.org/solid_waste) ways to reduce costs. Also, the more sorting into the various types, the higher the value at the other end. Most Pacific countries have relatively cheap labour and sorting recyclables can be an excellent community and economic development initiative. Unfortunately, some countries are allowing the import of plastics that do not have their resin type stamped on them. This makes sorting almost impossible without very expensive equipment; it also means that your collected plastics can only be sold as “mixed plastics”- the lowest value category.

The first step necessary is to ban the sale of plastic containers that do not have their resin type displayed on the container (usually a triangular mark with a number on the bottom). Once this has been done, you can go about setting up a container deposit / refund scheme and a site to sort, bale and export.

The other alternative is to simply dump the plastics in landfill. While this happens to the majority of plastics around the world, the issue is much more difficult on atolls. Shredding the plastic is expensive but can help reduce its volume, and a cost – benefit assessment would be sensible before deciding to purchase a plastic shredder. Plastic easily floats or is blown away, so they should be contained in the landfill with a cover material such as other waste, sand or even a layer of organic waste such as coconut husks.

Bulky wastes

The term “Bulky wastes” covers many different types of waste, but refers primarily to large metal-based products such as cars, small boats (dinghies), washing machines, refrigerators and other pieces of dead machinery. The primary concern is that the items are often costly to move, and consume significant amounts of space in a landfill as well. Some have hazardous components, for example ozone-depleting substances in refrigerators, or oil or batteries in cars. These should be removed and handled separately. Otherwise, most bulky waste causes relatively few environmental problems.

Some parts can also be re-used in creative ways. Car tyres have become crash barriers; filled with concrete they can be used as retaining walls; or stacked and filled with compost, for growing sweet potatoes.

Large items are often a collection of many types of waste and the metal parts may be recyclable.

Some countries have banned certain categories to reduce the impacts. For example, cars older than a certain number of years have been banned to stop the problems of obsolete cars being imported, and then becoming a waste problem soon after.

As with any recycling, the key policy outcomes are (1) to reduce the costs to recycle and (2) to try to get the costs of recycling paid for by those who consume the product. Again, deposit / refund schemes can work here. The deposit will encourage consumers to return the products to a central point where they can be prepared for export and or recycling. As these large items are expensive to transport, this can save a lot of money. For example, a deposit on cars can encourage owners to drive or tow them to a central point where they can be lifted onto a truck. Recovered spare parts can help pay for the system and provide a good source for local repairs. The levels of deposit and refund need to be carefully assessed, to determine how much needs to be retained for subsidising the recycling operation and for administration.

Metal recycling is a private business established on many Pacific Islands. A strong flow of recovered metals into those businesses can assist them with reaching thresholds of economies of scale with lower overhead costs. This in turn assist the recycling of the products you have targeted. Private businesses are usually much better than governments in handling the export of goods into an overseas market place. Getting existing experience for import / export involved is always valuable for maintaining a viable recycling system.

For some atolls, the costs and logistical difficulties of re-exporting bulky waste is simply prohibitive. In those situations the best option is to dispose of the goods in a way that assists - or at the least, doesn't harm the environment.

Bulky items have been used to contain land reclamation works in atoll lagoons. Unfortunately, there is growing evidence that dissolved iron can act as a stimulant to the dinoflagellates that cause ciguatera poisoning in reef fish. Car bodies have a limited life as a barrier in the lagoon, and can end up as dangerous rust wrecks within decades or less.

Bulky wastes can be used as bunds for an above ground landfill if landfill space is extremely limited. They have to be built sufficiently strong to withstand cyclone and storm surges; and will also rust out in time.

Another approach is to dispose of the bulky wastes offshore, in the very deep seas some distance off the atolls. Under the London Convention, the site of the dumping must be recorded and any hazardous materials removed first. Small quantities dumped in an almost anoxic (oxygen-free), high-pressure and cold environment means that any rusting will be very

slow and allow for maximal dispersal over very long periods of time. While this is not the best solution, the environmental impact is small compared to the alternatives available to the atolls. Deep-sea disposal of bulky waste is preferable over land or lagoon disposal.

Organics

Organics include garden waste, food, paper, and cardboard. They represent a major opportunity and resource for all atolls and, to a lesser extent, low islands. Food waste is often re-used as pig or dog food, yet most atolls have between 30% and 50% of the waste going to landfill. Minimizing that volume prolongs the life and value of the landfill, and can make a significant contribution to the public health of people of the islands. In addition the very poor coral-based soils need nutrients and moisture retention if they are to grow any fresh vegetables or fruits – that's where organics really help, too.

Collecting and separating organics from any contamination can be expensive so every effort should be made to encourage households to separate and compost their own organics. They can use the easy method of banana circles or simple compost heaps or the more labour-intensive active composting favoured by keen gardeners. All techniques are described in the “Waste is a Resource” Kit (www.sprep.org/solid_waste).

Some people will never be interested in gardening or haven't the space. They still produce organic wastes, so the next best option is to have a village or neighbourhood farm that utilizes that waste for compost.

The most expensive option is to handle composting at a municipal level. Unless there is a fully user-pays system (a rarity across the Pacific), the major potential cost is the collecting of the organic waste from individual households. Although less volume may be collected, it may be better to organise a self-delivery system: people drop off non-contaminated organic waste and are rewarded with some incentive such as finished compost, produce from the farms, etc. This can halve the collection costs and also tends to produce a much cleaner compost: you can inspect loads to assess whether they aren't too contaminated with other rubbish to be acceptable (in most Pacific countries, yard sweepings of leaves and trimmings and plastic litter are all put together).

Good ways to fund organics minimization are very difficult to find. Compulsory charges like taxes or a simple allocation from the budget are the usual methods. User-pays systems will not encourage people to separate or self-deliver. There is unlikely to be a market for the finished compost that is capable of fully funding the operation, but linking the project with agricultural or mini-farm initiatives makes sense. Agriculture will have significant expertise and probably a market for fresh fruit and vegetables. Any composting initiatives need to be well linked to non-communicable disease initiatives such as heart disease prevention through better nutrition to provide a strong motivator for behaviour change.

In your cost analysis, make sure you account for the money saved by the waste minimization initiative. If you can run a communications campaign that diverts 30% of the organics into home composting and organics were previously 50% of the waste stream. Then you will be saving approximately 15% of your collection costs, and 15% of your operating costs at the landfill. There is also a saving in prolonging the life of the landfill here by 15%.

Hazardous wastes

Minimising hazardous wastes is one of the most important issues you can tackle as a waste manager. Hazardous wastes are low in volume but high in environmental and public health impacts. They include car batteries, used engine oil, coolants from refrigerators and air-conditioning, pesticides, weedicides, some medical wastes and various relatively rare specialist chemicals such as PCBs (polychlorinated biphenyls).

Hazardous wastes that are used by the public such as car batteries, can be handled through deposit / refund schemes. As for other materials, part of the deposit paid on purchase is retained to fund the recycling costs. The scheme needs to collect deposits from the imported cars as well as from new batteries that are sold separately, or else insufficient will be collected to pay for the refunds. The current price for recycling lead will just cover the costs of shipping. More information on practicalities can be found in the “Waste is a Resource” Kit (www.sprep.org/solid_waste).

Lead from car batteries is often re-used for fishing sinkers. The public needs information on how to neutralize the acid, and how to recover and melt the lead safely.

None of the other hazardous wastes have simple recycling or disposal options. They are often very expensive to transport and dispose of, even in developed countries. This makes minimization even more important.

For pharmaceuticals, weed killers and pesticides, the key is to minimize the quantities purchased at one time. Most of these hazardous wastes are now surplus or out of date.

Governments can be the worst offenders by purchasing excessive amounts to fully utilize an aid allocation. It is far better to negotiate with donors a sequential purchase, as and when additional volumes are needed. A public communications programme should point out the environmental and economic costs of importing excessive amounts.

Holding a hazardous waste collection day every now and then can get people to bring in hazardous wastes before their old containers rust out or lose their labels. Some donor countries may be willing to assist with reducing the costs of transport and disposal. All the forms to comply with the Waigani and Basel Conventions on shipping hazardous wastes are available on the “Waste is a Resource” Kit (www.sprep.org/solid_waste).

There are enormous opportunities for minimization of medical wastes. Most hospitals and clinics are very poor at segregating the hazardous and infectious wastes from the normal benign wastes. A good training programme for *all* hospital staff can significantly reduce the amount of waste that really has to be burnt. Small volumes of expired drugs can be disposed of in good incinerators; they should make up only a very small percentage of each batch, otherwise they will reduce the temperature too much and cause only partial destruction.
