

## Discussion paper *Cost-effective Infrastructure*

Integrated waste management systems should possess elements of reduction, collection, recycling, and disposal. One of the significant challenges for waste managers is prioritising and apportioning their budget between these elements to get the best outcome.

### **Cost/tonne**

A recent SPREP – International Waters Project study into the economic costs of waste management in Tonga found, after a capital cost of \$9M, the proposed solid waste collection and new lined sanitary lined landfill system for Tongatapu is expected to cost about \$2 million each year or around **\$170/tonne**.

The costs of different elements varies enormously between countries and even within countries (atoll vs high island; urban vs rural). In general, the PICTs have lower labour costs and higher technology costs than their more developed neighbours. This is important to remember when comparing over-seas systems and developments.

### **Semi-aerobic landfill**

The semi-aerobic Fukuoka method landfill up-grade at Taifagata in Samoa will cost about **\$400K**. This facility is not lined but has a consolidated base with leachate drainage system which will collect most leachate for treatment in a trickling filter before “polishing” in small artificial wetlands.

### **State-of- the art system**

Guam has embarked on a new system to replace their old inadequate landfill. Closure, remediation and new hazardous waste landfill, general waste landfill and other facilities are expected to cost near **\$50M in total**.

These three examples show that, no matter which model chosen, the costs of modern waste management assets are considerable. In the case of landfills, maximising the life of the asset can have significant financial benefits.

## **Asset Preservation**

Techniques such as

- minimising day cover through bio-degradable plastic tarpaulins or even simple removable tarpaulins,
- rapid consolidation through the semi-aerobic Fukuoka method or controlled leachate recirculation, and
- good compaction by bulldozers or purpose-built compactors, both to increase density and also to allow higher batters and cell construction,

should be part of planning and on-going management assessment for cost benefit. It should also be noted that the siting of landfills is getting more difficult in every country. Regulatory hurdles, customary law, and neighbourhood opposition are all getting longer to negotiate. In atolls, land is so scarce that any landfill site is extremely precious.

Given the increasing value of landfill airspace, a modern waste system will methodically assess how to reduce the material being accepted into the landfill. This is as much a financial as environmental issue. Bulky or hard-to-compact materials such as car bodies, tyres and white goods should be excluded for use or recycling elsewhere.

Organic (food and vegetation) waste represents the majority of the waste stream. If paper and cardboard are included, the proportion can be 2/3s of the incoming waste stream. When possible, separation and composting can provide a very effective waste reduction strategy.

The cleaner and freer of any contamination, the greater the commercial and agricultural value of the compost. The coral-based soils of the atolls have a heightened need for this material. If organic material cannot be segregated before landfilling, either rapid semi-aerobic digestion or gas capture and utilisation could be considered to reduce the negatives of landfilling organics.

## Collection systems

Collection systems are usually the most expensive component of a waste management system, often consuming 3/4s of the on-going costs, depending on labour costs and collection efficiency. Because they are on-going, there is a reluctance for aid donors to fund collection systems other than start up costs. For this reason, it is vital that the costs of collection be as cost-effective as possible whilst still achieving the waste management outcome. It is important for collections systems to be reliable or the public will be reluctant to pay or even participate. For that reason, it is usually better to begin small and then expand as capability increases. High tech collection using wheelie bins or compactor trucks are at a much higher risk of failure and reliability as well as collection efficiency needs to be considered. Wheelie bins have many other uses and a high theft rate is common where ever they are used so a

significant replacement budget needs to be part of their adoption. They are susceptible to dogs and pigs knocking them over so stands or enclosures are often needed as well.

## Drop-off / Recycling nodes

Systems that encourage residents or businesses to consolidate their wastes or deliver their recycling to central drop-offs, can often significantly reduce collection costs but that can come at reduced yield which can mean more litter or less waste diverted from landfill. The distance between them depends on the mobility of the population. Open drop-offs can also facilitate informal recycling and can be expanded as the scope of recycling increases. In some places, they have also been used successfully as a payment point for refundable wastes such as bottles or batteries or tyres if a point of sale deposit is collected. In this way, they can be operated by private businesses under licence and deal in 2<sup>nd</sup> hand goods as well.

## Incentives

Getting residents and businesses to do as much collection, sorting and delivery as possible offers a cheap system. Incentives such as refund schemes, prizes, reduced fees for segregated loads, taxes on hard to manage wastes such as plastic bags – all these should be considered as a package to reduce the high costs of waste management. In countries where income is low, incentive-based schemes can generate significant employment for unskilled workers at little cost to the government as long as the funds have been sourced from the sale of products causing the problem or from those who benefit such as the tourist departure tax in the Cook Islands.

### **Tongan litter**

The IWP project in Tonga found that the appearance of Tongatapu is the highest waste priority for both residents and the tourists. This means a waste collection system with litter reduction as a high priority outcome, will have widespread support because that both the community and commercial need is met.

### **Food for garbage**

Curitiba (Brazil) found it cheaper to hand out food (purchased in bulk from local farmers) at central collection points in exchange for bags of rubbish than to fund a household collection through the densely populated slums.