

REPORT

ASIAN DEVELOPMENT BANK

Technical Assistance for Effective
Waste Management and
Recycling in Tuvalu
TA No. 4214-TUV

Inception Report (Final Draft)

Report prepared for:

ASIAN DEVELOPMENT BANK

Report prepared by:

TONKIN & TAYLOR INTERNATIONAL LTD

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Job no: 713625

Auckland, New Zealand
19 Morgan Street, Newmarket
PO Box 5271, Wellesley Street
Tel: 64-9-355-6000
Fax: 64-9-307-0265
email: auck@tonkin.co.nz
website: www.tonkin.co.nz

ABBREVIATIONS / GLOSSARY

AAD	AusAID Dumpsite
AMC	Australian Managing Contractor (for TWMP)
APM	Assistant Project Manager
AusAID	Australian Agency for International Development
“Bring” System	A system where the public are able to “bring” end of life goods or other waste to a dropoff facility, with or without charges applying to disposal
Bulky waste	Car bodies, disused shipping containers, derelict water tanks etc
DOH	Department of Health
EKT	United Church of Tuvalu
ELA	End of Life Appliance (e.g., refrigerator)
ELV	End of Life Vehicle
FK	Funafuti Kaupule
FTF	Falekaupule Trust Fund
GoT	Government of Tuvalu
Hangar	The Nissen Hut building provided by GoT for hazardous waste storage and other WMU activity
ISC	Implementation Steering Committee
ISWP	Integrated Solid Waste Plan
MFPEI	Ministry of Finance, Economic Planning and Industries
MNREE	Ministry of Natural Resources, Energy and Environment
NCSA	National Council for Self Assessment
NEMS	National Environmental Management Strategy
NFD	Northern Fongafale Dumpsite
PM	Project Manager
SPREP	South Pacific Regional Environment Programme
SW	Solid Waste
TA	Technical Assistance
TAP	Technical Assistance Paper
TANGO	Tuvalu Association of NGOs
TNSSD	The July 2004 Tuvalu National Summit on Sustainable Development
TPR	Tripartite Review
TWMP	Tuvalu Waste Management Project (AusAID : 2000 – 2002)
WMU	Waste Management Unit
WS	Waste Specialist

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1 INTRODUCTION

1.1 General

The Government of Tuvalu (GoT) prepared the "Kakeega o Tuvalu" in 1995. The 1995 strategy document, as verified by community surveys since, identified that inter alia, improvement in solid waste management, was seen as a very important issue to mitigate both public health risks and general environmental degradation in Tuvalu. This has since been reinforced at other meetings and summits including the July 2004 Tuvalu National Summit on Sustainable Development (TNSSD) (2 weeks) and a follow-up week-long, environmental workshop.

The National Environmental Management Strategy (NEMS) was prepared in 1997 as the basis for the GoT's environmental policy and legislative development (ADB, 2002, SPREP 1997). Waste management and pollution control was identified in the NEMS as one of five key environmental risks in Tuvalu. The GoT responded by strengthening the Ministry of Natural Resources, Environment and Energy (MNREE) and providing staff dedicated to addressing specific environmental issues (including waste management and pollution control), with the Waste Management Unit (WMU) set up concurrent with the implementation of the AusAID co-funded Tuvalu Waste Management Project (TWMP), in 2000.

Between 1995 and 2000 a number of donor agencies provided some support to the Tuvalu waste system, but the first major inputs came from the AusAID co-funded Tuvalu Waste Management Project (TWMP), that ran from February 2000 through to June 2002.

In 1999, the Tuvalu Falekaupule Act was passed in to law and over the period since, responsibility for local government services, including aspects of solid waste management in Funafuti, have been devolved to the local Kaupule, which in effect acts as a town council, but with an indigenous perspective in relation to service provision. The Funafuti Kaupule (FK) was not significantly involved in the TWMP until relatively late in the programme and hence FK's capacity in terms of implementing sustainable solid waste services for the entire island of Fongafale remains limited as well as constrained by the governance structures inherent in the Falekaupule Act.

The ADB TA 4214: Effective Waste Management and Recycling Project was proposed in 2003 and is aimed at picking up where the AusAID TWMP left off, and working towards building a sustainable solid waste system for Funafuti. This will involve FK, WMU and other agencies such as the Department of Health working together to determine a sustainable waste strategy, sustainable structures for service delivery and sustainable funding sources for ongoing service provision on Fongafale. Later this model could be extended to the rest of Funafuti and the other islands of Tuvalu.

1.2 Objectives and Purpose of the TA

The stated objectives of the TA are to:

“.... improve overall waste management on the island of Funafuti (Fongafale) by building a permanent and sustainable waste management programme, reduce indiscriminate waste disposal, and promote awareness of appropriate sanitation and waste management.”

Consequently the stated focus of the TA (according to the TOR) is to be in three key areas:

- i improvement in separation, collection, treatment, and disposal of solid waste (both organic and inorganic)
- ii promotion of markets for recycled products, compost, and organic fertilizer by supporting community and home gardening initiatives
- iii capacity building of the Funafuti Kaupule and Department of Environment (DOE) (specifically the Waste Management Unit (WMU)).

The key anticipated output is improved living conditions, and the improvement effected is to be measured and quantified.

The project Technical Assistance Paper prepared by ADB indicates the TA is to comprise five components, to support the overall objectives:

- i Organic waste separation, collection, treatment and recycling. This will include the establishment of a community operated, managed, and maintained garden on Funafuti, where by-products from the treatment of waste will be used as fertilizer. Complementing this will be establishment of a pump-out system for septic tanks and a program of green waste recycling.
- ii Implementation of an inorganic waste reduction and management system. This will involve (i) design of an appropriate and environmentally safe system of medical waste disposal and hazardous and toxic waste collection and storage, and (ii) review (of the) implementation of a collection strategy for recyclable inorganic wastes such as aluminium cans and recommendation of ways to improve efficiency and sustainability.
- iii Promotion of community participation in, and public awareness of, appropriate techniques for managing waste and recycling. A programme of activities to be implemented involving (i) promotion of waste management and recycling; (ii) promotion of good sanitation practices; (iii) mobilization of non-government organizations (NGOs) and community groups (e.g., schools, churches, women and island groups) in formulating sanitation, environment, and public health programmes; and (iv) encouragement of income generating activities, such as home gardening, to encourage the use of compost and organic fertilizer and improved nutrition.
- iv To review, and make recommendations for updating existing legislation that relates to waste, as appropriate.
- v To provide assistance for capacity building to support a permanent and sustainable waste management program. Institutional development, consulting services, and project implementation support will be provided. Training and consulting services will be provided to assist in implementing project activities, as well as for capacity building of the Funafuti Kaupule and WMU.

The specific detailed TA tasks for the waste specialist are defined in the TOR, included as Appendix A. Tasks for support consultants are commented on in Sections 3-5.

C. WRITEUP OF INITIAL TECHNICAL FINDINGS

C.1 POLICY FRAMEWORK

The only policy document setting solid waste strategy is the NEMS, specifically Chapter 8. Surprisingly the NEMS considered Tuvalu's solid waste and other pollution "not serious" in 1997, as most problems were restricted to Funafuti. However, on Funafuti, even at that stage, solid waste pollution was a significant issue.

The NEMS highlights a number of key points in relation to the solid waste system, specifically:

- The need for environmental education at all levels to amend behaviours
- The importance of reducing waste and of recycling where practical, particularly in relation to organic waste
- Maximising the value of landfills by reducing the residual waste volume by all means available
- The possible role of material flow controls, differential tariffs and deposit schemes, based on the "user" or "polluter" pays principle, as well as direct charges
- The important role of landfill in a sustainable waste management system
- The need for a frequent, regular collection service that has universal participation
- The under-resourcing of island councils in relation to solid waste services
- Improvements required in relation to petroleum, medical, and chemical wastes
- The possible option of using ocean disposal for some bulky wastes and certain physically fixed chemical wastes.

In terms of policy, Chapter 5 of the NEMS sets out a proposed strategy for progress towards proper environmental management. These are:

- Adopt an integrated approach to environmental policy and planning
- Submit proposed policies, development programmes and projects to Environmental Impact Assessment (EIA)
- Introduce a comprehensive framework of national and local environmental law, together with means for enforcement which are socially acceptable and culturally sensitive.
- Review adequacy of institutional mechanisms and administrative controls and strengthen as necessary.
- Institute resource pricing in national accounts and other economic policy for achieving sustainability

These strategic elements are then fleshed out into a series of programmes for development and programme profiles. Two key projects were identified as:

- Prepare and guide development of the National Environment Act
- Review the role of local government in environmental management and investigate options for other technical assistance.

Discussions to date indicate that since 1997 there has been limited progress on these programmes, so in terms of this project what needs to be done is essentially to draft the "Solid Waste" section of any new National Environment Act, as well, as

appropriate By-Laws for Funafuti. Such work does not appear to conflict with any existing legal frameworks of policies. As commented on elsewhere, the bulk of a waste By-Law is already provided within the Public Health Act that commenced on 1 January 1926.

C.2 CURRENT SOLID WASTE SERVICE PROVISION ON FONGAFALE

On Fongafale the governance and waste service provision situation remains complex, with a definite split between two organisations with the Funafuti Kaupule (FK) fulfilling some roles, the Government dealing directly with other matters itself via the WMU set up in 2000. WMU and FK management do not communicate frequently or in an organised way. There is limited interaction at operational level.

this is set out { The Funafuti Kaupule sees itself as responsible for solid waste service provision only for the base population of Funafutian ethnic origin. That is, people from Funafuti and not people from other islands that have moved to Fongafale in recent decades and hence swelled the local population. *head more classification* }

At the current time the FK has responsibility (although it is uncertain how and where this is defined), for waste service provision for only the central (Funafuti population predominant) area of Fongafale, directly to the north of the commercial area of Vaiaku. That is for the areas shown on Figure 1. This takes in a zone from Te Auala o Alofa Rd (the road adjacent to the Post Office / Police Station), and running north to include both the main roads to a point between the Hospital and Te Auala o Tenualea Rd. This area, which includes (in theory) houses located away from the main roads where waste is able to be brought to the roadside, covers approximately half the dwellings on Fongafale – some 250 in all.

However, participation in service delivery is voluntary and hence participation varies. The result is that some areas / properties are well maintained with little evidence of indiscriminate waste dumping, while others are subject to both on-property and off-property waste dumping. FK charges a household fee of \$30/year for service provision and as noted by ADB in the fact finding report, some residents elect not to pay the fee because of perceived poor levels of service. This results in a proportion of waste from the community being dumped either indiscriminately, or independently and without any attempt at greenwaste separation for example.

FK disposes of the waste it collects by open dumping and burning on the northern part of the island. There is currently no attempt to sort waste or recycle materials before dumping and burning by FK. That is, FK runs a very basic (and technically inefficient) operation based on collecting whatever is put at the roadside and dumping it at the NFD.

Outside the central area serviced by FK, that is, for the rest of Fongafale, waste services are provided by the Waste Management Unit (WMU) set up by the GoT as an adjunct to the AusAID TWMP that ran from early 2000 to mid-2002. The WMU is responsible for waste collection and disposal for the balance of Fongafale (approximately 50% of households, but approximately 80% of the island area).

Within this area, at the northern tip of Fongafale beyond the causeway, FK independently dumps and burns waste. *FK is not responsible for heavy waste.*

North of the fuel depot WMU has constructed a controlled dumpsite in Borrow pit 4. This was part of the AusAID works programme. However, this site is not used by FK, which instead hauls and dumps in an uncontrolled fashion on the northern tip of the island, a further 4.1 km away from the collection area.

WMU provides weekly collection to residents in the area serviced. However, much of the area serviced includes the populace that has settled on Fongafale from the outer islands. As a consequence household incomes are generally low and the standard of housing in these areas is generally poorer than in established central part of the island. Consequently uptake of the collection service is low and WMU is no longer able to charge fees for its service. However, the GoT still requires the collections to be made by WMU (if the collections were not made the area would currently remain un-serviced as the FK has indicated it is not currently FK's role to service the WMU area).

Further compounding system difficulties is the prevalence of littering and stray dumping in the area serviced by WMU (littering or blown litter is a problem in most areas). Dumping appears relatively widespread and much of the island is degraded by piles of assorted refuse and collecting debris. "Picnic" areas at the northern and southern ends of the island are particularly prone to littering. Apart from domestic (household refuse), discarded materials include cars, whiteware, coconut waste, derelict shipping containers, disused water tanks and concrete rubble.

It is evident that around the island, particularly at its northern and southern ends, significant areas of undergrowth camouflage what are essentially "boneyards" of waste materials. Much of this waste should be able to be recycled – the persistent presence of aluminium cans (now ubiquitous on the ground around Fongafale), large quantities of organic waste and paper being key indicators of a lack of community buy-in to a sound waste strategy. WMU currently does not have the resources to deal with this ongoing waste load, most of which would require labour and suitable vehicles to remove, sort and landfill, even if landfill space was freely available, which it is not.

C.3 EXISTING INSTITUTIONAL CAPACITY

In the case of the FK, institutional capacity in the waste sector is low, with only six staff, most engaged on waste collection and dumping activities. Clear strategies for waste management are not yet established within the FK, and both funding and resources (labour and machinery) appear inadequate. The total year 2001 FK solid waste budget funded out of the FTF was only \$8000. This compares with \$20,828 spent on upgrading the Matagi Gali bar, and \$2,152 spent on dog destruction (source: ADB, 2002). Current systems, funding and community participation are below the level required for a sustainable waste system to be established. Equipment is limited to:

- One tractor (well used) towing a 2.4mx1.2m tandem "cage" trailer (ex TWMP)
- One Dyna 400 flatbed truck (ex TWMP)

- One Vermeer BC625 shredder (ex TWMP) [not being used]

Spare parts are scant and there is no budget for non-routine maintenance or replacement of donated vehicles. In the case of WMU resources are also limited, but more significant than those of FK. There are two management and nine workforce staff, plus a supervisor/landfill operator. In addition there is a loader driver/mechanic, a driver/compost operator and 4 collection labourers. There are 2 other labour staff looking after the piggery and medical waste facility.

Senior WMU staff visited Australia as part of the TWMP project. These staff were able to visit landfills, transfer stations and composting operations, but lack formal training in composting processes, quality control and marketing. WMU goes through a formal budgeting round in October each year, but final budget grants are typically not confirmed until well into the operational (calendar) year. The annual budget request is typically cut back by Ministry of Finance, and barely covers operating costs. Some operations (e.g., the model piggery) are clearly not covering costs.

WMU equipment comprises:

- One Dyna 400 flatbed truck with low cage sides and a lifting crane (tray needs replacing)
- One 2.4x1.2 m trailer with mounted septic tank pump-out tank and pump
- Vermeer BC625 Shredder (petrol driven)
- Toyota Hilux 3.0D 4WD utility
- Komatsu WB93R Utility loader/Backhoe

FK's office is located on Teaua o Fongafale Rd, south of the Hospital WMU on the other hand is attached to DOE, with it's office located in GoT buildings situated between the new Government offices and the old wharf in central Vaiaku, some 1.5km south of the FK office and depot.

C.4 SOLID WASTE SYSTEM COMPONENTS

C.4.1 ORGANIC WASTE DIVERSION / COMPOSTING

As was identified in the TWMP report "Waste Trends and Targets", the waste stream in Funafuti is growing more "exotic" with time and as household incomes increase. Evidence for this is the sharp growth in non-indigenous waste materials in the waste stream such as items like plastic, disposable diapers, and paper. Conversely, Funafuti waste is low in organic food waste as most of this is diverted for use a pig food at a household level.

Of what is left, a significant proportion is garden and kitchen food waste (25-30% by weight), but the bulk of this is coconuts / coconut shells. This is evident at the WMU landfill where roughly a third of the exposed waste is coconut husk and shell (this has implications for composting and waste management in general).

Composting was set up and carried out as part of the TWMP at The Hangar. Over the period 2002 to late 2003 some 170m³ of compost was produced, with the product appearing to be of low quality. The compost seen is typically coarse (un-sieved),

“green” and immature with pig manure content not fully rotted. The compost piles (small heaps) are not turned effectively and the compost is not ‘cooking’ as it should. Detracting from product quality (compost product as seen June 2004) are:

- The compost is not fully mature
- No systematic composting infrastructure exists
- The shredder type selected cannot deal with much of the greenwaste, which tends to be fibrous – this results in problems separating greenwaste and limits composting potential
- Windrowing is crude and carried out on an earth surface resulting in a difficult operation
- The compost is not monitored for temperature and windrow turning
- The compost is not screened prior to sale and hence is relatively coarse and fibrous
- There is no roofed maturing shed and no load-out facilities (“compost” [effectively pig waste-enriched mulch] is sold by the “bin” of approximately 80 litres).

Clear improvements are possible to the composting system, although the relatively poor quality “compost” currently being produced remains in demand. Typical sales are, however, less than \$20-\$30/week at \$2/bin. The extent of the demand on a long-term, sustainable basis remains indeterminate. However, it is expected that long term, a mix of composting and shredding for mulch will be the process adopted for handling greenwaste, depending on the demand for compost.

C.4.2 OTHER ORGANIC WASTE

C.4.3 COMMUNITY GARDENING

In the more established central village area of Fongafale there are a number of households with small gardens, but these tend to be of limited size. With the support of the Government of the Republic of China (Taiwan), a demonstration garden has been established on the eastern side of the runway, near the prison. Inspection on 8 July and again on 14 July showed the garden to be well established, with full time caretaker/gardeners and ample water storage. The garden measures approximately 20m x 50m and is well laid out in raised beds with crops of lettuce, chilli, sweet potato, tomatoes, squash, cabbage, melon, sweetcorn, spring onions and a few fruit trees. Seedlings were being grown on in shade-houses and the garden appears productive, albeit that soil fertility appeared a little low.

Discussions with the gardener /caretaker indicated that the garden has used around 2m³/yr of WMU compost. Compost is seen as very beneficial (essential), but the quality of the WMU compost is considered low. The garden staff now make their own compost on site in a simple compost bin as the WMU compost is seen as unsuitable. There is also concern over the WMU charging the garden (bilateral aid) project for compost. Green coconut husk was being used as a mulch mat and as pathway material to keep soil surface temperatures down and to retain moisture. Produce is apparently sold to local markets.

Any large community garden initiative under this project would sensibly integrate with and extend this project, probably in the same locality as there are few other land options. Obtaining land and finance to set up basic infrastructure such as a shed (roof area), water tanks and irrigation, together with the supply of basic garden tools, sprays and seed stock will be key barriers to implementation of a community garden extension.

Another issue that needs to be taken into account is the issue of flooding and salinity related to high brackish groundwater levels and king tides. Apparently the area around the garden does flood at times with salt water.

In summary the model garden provides a base to work from. It also demonstrates some of the restrictions that apply to such initiatives: land availability (the lack of), high salt water tables and hence soil salinity issues and infrastructure requirements. As noted in the Stakeholder Workshop held on 15 July, householder-based initiatives are favoured by the Dept. of Agriculture and household level composting is being promoted. This appears to be the sensible course of action, with the knowledge gained from the demonstration garden, together with perhaps NGO/Taiwan garden knowledge transfer and initiatives for seedling development for the community to be encouraged.

C.4.4 PLASTICS

GLASS

METAL OBJECTS

OTHER PROBLEM WASTES

OIL

DAIPERS

HAZARDOUS WASTES

C.4.5 BULKY WASTES

Bulky wastes represent a particular problem for Tuvalu. The TWMP report "Waste Trends and Targets" identifies estimated annual disposal needs as follows:

Scooter	130
Motorbike	60
Car	60
Truck / Commercial vehicle	20

In addition, other bulky wastes include whiteware, disused plastic water tanks, disused shipping containers, drums and roofing iron. While it is unlikely that the numbers of such items will continue to increase at a rapid rate, increasing GDP will

see an ongoing trend towards more vehicles and whiteware per capita. This is a universal and inexorable trend where no import restrictions or prohibitive tariffs exist.

Disposal of used vehicles and whiteware in remote locations is a major problem. The TWMP identified crushing and incorporation as "retention bunds" in the landfill. That is an option but there is no crusher, carbody stripping and removal of oil and tyres still needs to be dealt with, funding issues etc).

There is potential to remove reusable components of components that can be used as spares. However, in a small community and with rapidly changing models of vehicles and appliances, getting much traction in that regard is difficult without severe controls on imports (e.g., restricting imports to only one brand of vehicle to ensure maximum salvage of spares and hence maximised unit life). Used vehicles represent a disposal in even the most developed of centres, with readily accessible markets for scrap. Typically vehicles are required to be stripped (all linings and seats and electrics removed), fuel tanks and engine sumps, differentials and gearboxes drained, and tyres removed. Vehicles are then typically crushed to reduce size (2 typical vehicles crush into a 1.5m x 1m x 1m "bale" weighing approximately 0.5tonne), and stockpiled for transport to steel recycling mills. An ISO shipping container can typically accommodate 32-36 crushed vehicles.

In Tuvalu the option of crushing and off-island recycling would involve significant cost as either a dedicated crusher would be required, or a crusher would have to be transported from NZ or Australia every 1 - 2 years to crush any backlog of such carcasses. Investigations have confirmed that this has been tried before in the Pacific islands and found to be uneconomic (that is the operation requires subsidising in some way). The low residual value (NZ\$100/tonne at Sims metal industries in Auckland) of crushed car-bodies, is such that a significant subsidy would be required to initiate this in Tuvalu.

In the interim disused vehicles and whiteware would need to be collected, stripped and stockpiled in a way that did not degrade the environment either directly (e.g., through fuel or oil spillage), or indirectly (visually). In any event machinery is required to collect and handle the wastes, although it is evident that given the small size of Funafuti, such wastes could be brought to a central handling area for initial preparation for disposal (for a charge). That is, a "bring" system could be applied, backed up by a By-Law governing derelict vehicles.

After stripping for electrical, aluminium or other useful recyclable products (e.g., copper), the options for dealing with bulky waste are:

WHITEWARE

- Crushing followed by transport offshore for recycling (NZ, Australia or Asia)
- Deep ocean dumping, with or without crushing [check London protocol re-paint and insulation]
- Landfilling

ELVs

- Crushing followed by transport offshore for recycling (NZ, Australia or Asia)

- Deep ocean dumping, with or without crushing provided the carcasses can be sufficiently well prepared
- Landfilling
- Boneyarding

PLASTIC TANKS

- Modification for alternative use (e.g., groundwater pumping sump liners)
- Cutting, shredding and recycling (HDPE) (issues related to types of tank materials imported also affect these options).

SHIPPING CONTAINERS

- Gas-axing into manageable pieces followed by crushing and recycling
- Deep ocean dumping, with or without cutting and crushing

Options and system costs for the various options are separately developed.

LITTER

C.4.6 LEGISLATIVE FRAMEWORK

There are two pieces of legislation that are relevant:

Funafuti Town Council – Draft Garbage By-Law 1997

- This By-Law as drafted (it has yet to be enacted) is inadequate both in its content and its remedies. As noted elsewhere in this report there is no effective mechanism for enforcing such a law, even if it was in effect. To a large extent the original draft of this By-Law has been overtaken by developments in how the SW system is dealt with on Fongafale over the intervening period.

Tuvalu Revised Laws, 1978 – Chapter 35 Public Health and sub-Regulations as set out in Para 3.

Chapter 35 of the updated Tuvalu laws, 1978, through Para. 3, **includes as part of the law**, Public Health regulations drafted on 1 December 1926. Surprisingly perhaps, these regulations are, at least in substantive part, still relevant and appropriate. Hence the reality is that Tuvalu has, for a long time, had in place legal controls on dumping of refuse that could have been enforced, but apparently have not. Specific elements of the regulations that are applicable under paragraph 3 (1) in relation to waste disposal practices evident over the past few decades at least, include:

2. All houses, buildings and premises, and the land in which they stand shall be kept clean.
3. No stagnant water shall be allowed to lie in such lands for more than 24 hours unless treated to the satisfaction of a sanitary inspector....
4. No tins, bottles or other receptacles capable of holding water shall be allowed to remain upon any such premises or lands.

10. No person shall deposit or cause to be deposited any empty tin, bottle or other receptacle in any street, road, or other public place.
14. All garbage and rubbish which can be readily destroyed by fire shall be so destroyed; and all other garbage and rubbish shall be placed in tins and covered with fly-proof covers, and such tins shall be placed daily in positions convenient for collection.

In addition to the general liability provisions under Para. 3(1)15, Para 3(2) sets out liability further:

- (2) Any person who acts in contravention of any such regulations shall be liable to a fine of \$20 or in default of payment to imprisonment for 1 month and in respect of any subsequent offence to a fine of \$50 or in default of payment to imprisonment for 3 months.

So other than in respect of Clause 14 of the regulations, which is now out of step with modern waste disposal practice, regulations and remedies related to solid waste disposal have existed in Tuvalu for more than 75 years. While the original regulations were aimed mainly at direct vector control (principally mosquitoes, but also flies and rats), that reasoning remains fundamentally sound. The principal long term risk from indiscriminately disposed solid waste relates to stagnant water in containers acting as breeding grounds for mosquitoes than can transmit Dengue fever – still known in Tuvalu.

Other risks clearly exist from indiscriminate waste disposal, including direct infection due to contacting waste, or through cuts from contacting sharp waste, as well as water-borne disease. Large areas of indiscriminately disposed wastes are evident on Fongafale, particularly in the borrow pit areas towards the northern and southern ends of the islet. These are not only unsightly, but also still represent a direct health risk for the above reasons, even though waste disposal in some of those areas may now have ceased. There is ample evidence of significant open, floating waste in areas of Tuvalu, as well as extensive stray dumping on beaches and land. Many people are now conditioned to such conditions and simply accept it (and often add to it).

Nevertheless, the fundamental premise of controlling and containing waste remains as relevant today as it did in 1926.

The regulations clearly have not been enforced. They need to be updated and possibly transposed into a specific solid waste law to ensure clarity. Penalties also need to be updated. More importantly than either, enforcement must be taken seriously. To do so requires resources and a baseline from which to enforce. With the general open space environment on Fongafale as degraded as it currently is, a strong effort will need to be made to clean up the current highly degraded areas in parallel with improving collection and disposal services before enforcement could be effective.

C.4.7 LANDFILL

A controlled dumpsite (the AAD) was designed by Coffey as part of the TWMP. This commenced in Borrow Pit No 4¹ in 2002. The landfill was seen as an appropriate technology approach based on several factors:

- The site is relatively small (no calculations were presented by Golder, but current assessment suggests total waste input to the site when operating averages approximately 4-5t/d, which is equivalent to an uncompacted volume of approximately 6-10m³/d)
- Landfill life at current filling rates is assessed as 3-7 years
- The intent to divert the bulk of the collected organic waste and greenwaste to composting or other uses (e.g., pig food in the case of food wastes) [note if this was achieved landfill life could extend to 20+ years]
- The relatively high tidal flushing and hence leachate dilution effected
- The ecological suitability of the site
- Lack of other options

At the present time the AAD is not operating well. The site needs several features to enable it to operate effectively:

- Improved access to the tipface. Inert wastes need to be stockpiled at the site (large quantities are evident on the east side of the airport runway), and sited to form all weather access and a tiphead for waste vehicles
- A bulldozer (at least a caterpillar D6C or equivalent). This is needed to enable wastes to be pushed and compacted to reduce effects, maximise site life by achieving a higher compacted waste density and assist with shaping and grading of the final site
- Improved fencing
- Improved cover planning, programming and a suitable final cover design.

These site features need to be augmented by, ideally waste transport vehicles that can tip their load. Alternatively, additional labour is needed to unload wastes (at present the back-hoe is used for this and while that works, it means a lot of driving for the backhoe, which might be better employed as a dedicated vehicle at the compost operation where it would be subject to less wear and tear.

C.4.8 MEDICAL WASTE

Background

As part of the AusAID TWMP disposal of medical waste was assessed. A key TWMP initiative was to upgrade the existing incinerator, provide training and resolve issues with medical waste handling. The medical waste disposal aspect of the TWMP was reported in AusAID 2002, *Tuvalu Waste Management Project Safety review of Medical Waste Incinerator*. An inspection of the medical waste incinerator was carried out on 8 July. The incinerator was not operating at the time, but the infectious waste bins were empty and the incinerator had clearly been working earlier in the day. Key points noted during the inspection were: