



**CASE STUDY**  
**ON**  
**THE APPLICATION OF**  
**TRADITIONAL ENVIRONMENTAL MANAGEMENT**  
**PRACTICES, KNOWLEDGE AND VALUES**  
**TO SOLID WASTE MANAGEMENT ON MAJURO ATOLL**  
**REPUBLIC OF THE MARSHALL ISLANDS**  
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## ABBREVIATIONS

<b>ADB</b>	Asian Development Bank
<b>Alap</b>	Manager of Land
<b>CBEMP</b>	Capacity Building for Environmental Management in the Pacific
<b>CD</b>	Compact Disk
<b>D.U.D</b>	Delap, Uliga, Darrit (most urbanized area on Majuro)
<b>EEO</b>	Environmental Education Officer
<b>EPA</b>	Environmental Protection Authority
<b>EPSO</b>	Economic Policy, Planning and Statistics Office
<b>GEF</b>	Global Environment Facility
<b>Ha</b>	Hectare (2.2 acres)
<b>HPO</b>	Historic Preservation Office
<b>IWP</b>	International Waters Project
<b>Leroij</b>	Chief (woman)
<b>MALGOV</b>	Majuro Atoll Local Government (currently responsible for collection of trash)
<b>MIMRA</b>	Marshall Islands Marine Resources Authority
<b>MIVA</b>	Marshall Islands Visitor Authority
<b>MPW</b>	Ministry of Public Works (currently responsible for management of Landfill)
<b>NEMS</b>	National Environmental Management Strategy
<b>NGO</b>	Non-Governmental Organisation
<b>PDMC</b>	Pacific Developing Member Country
<b>PRES</b>	Pacific Regional Environment Strategy
<b>IA</b>	Ministry of Internal Affairs
<b>Iroij</b>	Chief (man)
<b>RETA</b>	Regional Technical Assistance
<b>Ri-jerbal</b>	Tenant/commoner
<b>RMI</b>	Republic of the Marshall Islands
<b>SPREP</b>	South Pacific Regional Environmental Program
<b>SWM</b>	Solid Waste Management
<b>TA</b>	Technical Assistance
<b>TEM</b>	Traditional Environmental Management
<b>WAM</b>	Waan Aelon in Majol (Canoes of the Marshall Islands)
<b>Weto</b>	Parcel of land

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## EXECUTIVE SUMMARY

### Background

The Republic of the Marshall Islands (RMI) is composed of 29 atolls and 5 low elevation islands in a relatively remote part of the north-central Pacific Ocean. A fragile ecosystem and a limited resource base (a total land area of just under 110 square kilometres) have caused the Marshallese to share a strong affinity with, and dependence on, land and ocean resources for their livelihood and economic development.

The traditional way of life has been, of necessity, an ecologically sustainable one, with care of the environment essential for future generations to benefit from the resources. However, the introduction of a cash economy and the need to satisfy increasing financial demands have led to increasing pressures on natural resources. Environmental degradation is now becoming more visible in the urbanised areas where resource use and rapidly changing lifestyles are generating non-biological wastes such as aluminium cans, plastics, and abandoned vehicles. Solid waste accumulation is a major issue in the major population centres of Majuro and Ebeye.

While life skills, agriculture, and other more practical subjects are taught in schools they are generally based on the latest technological findings with inadequate emphasis on the use of traditional, ecologically sustainable techniques. Indeed, awareness and understanding of the importance of traditional practices that have been a part of past generations are now disappearing due to recent sociocultural changes and modern influences. Hence, it is necessary to promote traditional environmental management by encouraging the incorporation of environmentally sustainable traditional practices with non-traditional practices.

The concept of promoting traditional environmental management practices and empowering traditional leaders to enhance the environment have been discussed at various Pacific forums for over 20 years. There have also been some very successful models of TEM (e.g. soil conservation on steep hillslopes in Papua New Guinea) already established in the Pacific, including the RMI (e.g. Canoes of the Marshall Islands). For the purposes of this case study, the term *traditional* refers to “knowledge, practices and values that are accepted as legitimate today because they have a foundation in the recent or ancient past”.

### Natural Resources and Environmental Management Issues

With a mean height above sea level of just 2 metres, the low lying atolls of the RMI are particularly vulnerable to climate change and sea level rise, which under a worst case scenario could render much of the RMI uninhabitable. Increased storminess combined with a higher sea level would increase both the rate and extent of coastal erosion. Higher sea level would also reduce the available land area, the extent of arable land and the volume of the fresh water lenses.

Of all the islands of the RMI, only one (Mejit) has a fresh to brackish water lake. All the other islands rely on either rainwater capture or, on the larger islets, exploitation of

shallow groundwater lenses. These freshwater (Ghyben-Herzberg) lenses are particularly vulnerable from over extraction (rendering them saline) and are easily contaminated. Indiscriminate waste disposal on the land has led to most of the shallow groundwater resources of the RMI becoming contaminated.

The soils on the islands of the RMI are, for the most part, highly permeable, very low in nutrients and exhibit high surface salinity, making them generally unsuitable for agriculture. Whilst these soils may have supported various forms of vegetation in the past, no endemic species are known today. Most of the islands are presently covered in coconut palms.

High birth rates and inward migration from the outer islands has resulted in extremely high rates of population growth, such that the population densities of Majuro and Ebeye are now amongst the highest in the world (RMI 1993). This rapid population growth has resulted in overcrowding in Majuro (population densities of over 2,500 per square kilometre), which is manifested in poorly constructed houses packed together without adequate sanitation and solid waste disposal.

The lagoon and near-shore reefs have traditionally been a major source of food and protein for the Marshallese. Destruction of the coral reefs has been occurring as a result of mining for aggregate (sand and gravel), dredging, channel blasting and boat anchoring. Coral death has also resulted from rapid algal growth arising from high nutrient loadings associated with domestic waste disposal.

In the RMI submission to the International Waters Project (IWP) during the 1997 formulation process, solid waste disposal was listed as the number one “major concern of marine and fresh water quality”, reinforcing the detrimental effect that uncontrolled disposal of solid waste is having on the aquatic environment. In addition to algal growth, the lagoonal waters adjacent to urban areas of Majuro have been plagued with “red tide”, a proliferation of dinoflagellates which can threaten marine life by lowering the dissolved oxygen levels in the water and which can also render some types of seafood toxic to humans.

### **Solid Waste Management Issues**

Traditionally, disposal of solid waste has been to ground. In the past, with low population densities and locally sourced biodegradable solid waste products such disposal presented few ecological problems. Now however, with high population densities and each household producing significant quantities of both biodegradable and non-biodegradable solid waste, such materials are accumulating on both the limited areas of land and the marine waters at ecologically damaging levels. Organic materials account for some 50% of solid waste on Majuro.

The traditional land tenure system has often constrained government led initiatives to improve the urban environment and conserve biological diversity. As all land in the RMI is in traditional forms of private ownership, the government has no effective power to impose land use controls. Landowners have often been reluctant to accept regulations pertaining to solid waste disposal or other measures that may affect their rights to do

what they want on their land. This has presented significant problems for government led initiatives to manage solid waste.

Currently there are very few constraints on what can be imported in to the RMI, and what forms of packaging these products arrive in. Once on the islands, however, there are few incentives for their eventual removal once they have served their intended or useful purpose. Accordingly, large quantities of abandoned solid waste items are accumulating on the islands, particularly Majuro, which need to be disposed of.

Many of the wastes disposed in Majuro have a high potential for recycling. From recent investigations undertaken by the government two different types of recycling programs appear to be feasible, commodity recycling and organic waste recycling. Commodity recycling includes food and beverage containers and organics recycling includes food waste and wood waste. Paper and cardboard can be recycled either as a commodity or in an organics recycling program.

The government study also concluded that 50% or more of the waste stream is compostable (including the cardboard and paper) and that there are very large quantities of aluminium cans and plastic polyethylene terephthalate (PET) drinking bottles being disposed. There are very high relative percentages of cardboard in the waste because of the need to import almost all consumer and food products. The high percentage of plastic water bottles is considered to be a reflection of the poor water quality on Majuro.

To date, recycling efforts have been minimal and focused on sporadic aluminium can collection at a handful of locations and a brief effort by the RMIEPA in the mid 1990's from which it was reported no cans were shipped off the island. Some small-scale organic waste recycling has been undertaken at the Taiwanese experimental farm in Laura and, in the past, some research on trench composting has been done at the College of the Marshall Islands (CMI) Laura campus.

### **Applications of TEM to SWM in Majuro**

With the very high percentage of organic material currently being disposed of to the landfill, the TEM practice of mulching or composting organic material to both increase the fertility and assist with water retention of the sandy soils clearly has an application for SWM on Majuro. Firstly, however, the organic material needs to be separated from the waste stream so that this can be treated using traditional methods of disposal such as mulch and/or compost. Before this can be undertaken, it is necessary to make people aware of the difference between biodegradable and non-biodegradable materials, and what materials can be recycled.

With the land tenure system and the traditional leadership structure, the support of the traditional leaders is essential for the successful implementation of any SWM initiative. Accordingly, by resurrecting the traditional values espoused in the Jabonkanaan, or wise sayings, the community should be able to take collective responsibility of dealing with the problems of solid waste accumulation on Majuro, under the leadership of the Alaps. As the traditional managers of the land, the Alaps have the ultimate authority over all of the land, and the disposal of waste products on it.

The Canoes of the Marshall Islands (Waan Aelon in Majol, or WAM) is one of the most successful examples of traditional environmental management operating in the RMI, if not the Pacific, and one that the traditional leaders have now picked up on throughout the islands of the Marshalls. Under this project, young Marshallese are taught the traditional methods of constructing and sailing outrigger canoes, so that this traditional knowledge is not lost. By utilising materials that are for the most part renewable and biodegradable, the WAM project results in less importation of alternative materials such as fibreglass and aluminium. By utilising a sustainable form of transport (wind power), the WAM project also reduces the amounts of fuel, fuel containers and outboards coming into the RMI, most of which eventually require disposal.

### **RMI TEM Project**

The TEM project in the RMI seeks to apply TEM knowledge, practices and values to addressing the solid waste management issues on Majuro Atoll, and the most densely populated villages (Delap, Uliga and Darrit, or DUD) of the island. The reason for selecting DUD was that the problem with SWM was most severe in these areas.

The TEM practice to be promoted was the separation of organic waste for use as vegetation mulches to enhance the fertility and water retention capability of the soils, and reduce the quantity of waste requiring disposal in the landfill.

The TEM values to be promoted were the spirit of coming together for a common cause that is the responsibility of all. Jimor Wodjipel Ra eo Bunwoj, or “spirit of coming together for a common cause which is the responsibility of all” is a saying that encourages unity of the people for the sake of the common good. This saying is particularly relevant to the TEM project by reinforcing the fact that the protection of the environment and responsibility and the management of the natural resources of the Marshall Islands is the responsibility of everyone.

### **Mainstreaming TEM**

It is clear that the TEM project has improved the status and morale of the traditional leaders of Majuro, and the knowledge of both the leaders and the community has been enhanced as a result of the meetings, workshops and powerpoint presentations undertaken by a strengthened EPA. TEM related aspects have also been incorporated into many of the strategies to achieve several key objectives relating to SWM in the latest 15 year RMI National Strategic Plan, Vision 2018 (2003-2018).

The project appears to have been highly successful in terms of raising the profile of traditional leaders and initiating discussions on how the role of traditional leaders may be integrated into current decision-making systems with respect to SWM on Majuro. In the RMI the issue of merging the customary land-ownership issues with government-enforced regulations has been one that the country has grappled with for some time.

This TEM project has enabled the establishment of a “legitimate” platform for discussions on the issue, using solid waste management as an example. As the land managers, the Alaps have a critical role to play in solid waste management on Majuro, where indiscriminate disposal of solid waste to land and sea has been occurring for decades. This is now recognised by the Alaps who have prepared their own solid waste

management action plan and are looking to form an association to better promote their role in environmental management overall.

The TEM project represents only a very small, albeit vital, step in solving the solid waste problems on Majuro. Traditional knowledge must be maintained, in programmes such as the Canoes of the Marshalls, if the importation of alternative products is to be minimised. Traditional practices, such as the mulching and composting of organic materials, must be encouraged in order to reduce the amount of waste requiring disposal to landfill and enhance the fertility of the soils. This will in turn allow the growing of fruit and vegetables locally. Traditional values must also be revived to ensure a collaborative approach is adopted to solving the many SWM issues.

TEM will not, on its own, solve the problems of solid waste on Majuro. However, any solution will only come about with the active cooperation and leadership of the traditional leaders. There are also many SWM issues that TEM cannot address. Linkages with other SWM projects are therefore essential if progress in SWM is to be maintained.

## 1. RMI TEM PROJECT

### A. Project Context

1. In early 2000 the Asian Development Bank (ADB) and the South Pacific Regional Environment Programme (SPREP) developed a coordinated effort to assist the Pacific Developing Member Countries (PDMCs), with the goal of sustainable utilization of their natural resources through capacity building to promote traditional environmental management (TEM) practices, knowledge and values. For the purposes of this project, the term *traditional* refers to “knowledge, practices and values that are accepted as legitimate today because they have a foundation in the recent or ancient past” (ADB 2000b).
2. A Regional Technical Assistance (RETA) project was formulated in consultation with the senior officials of concerned agencies, scientists, traditional environmental management groups and non-governmental organisations (NGO’s) in the Republic of the Marshall Islands (RMI), Vanuatu and the Cook Islands.
3. The goal of RETA was to be achieved by firstly collecting, compiling and reviewing the available information on traditional environmental management practices, and then using this information to develop resource material for both formal and non-formal education. This resource material would then be used to raise awareness of TEM in the PDMCs and to educate all levels of the respective communities in TEM.
4. In addition to the application of traditional knowledge, the RETA would also evaluate the past and present roles of traditional leaders in natural resources management, and identify possible roles for, and mechanisms for the promotion of, traditional leaders in present environment management structures.
5. The RETA also sought to strengthen the regional information network for the transfer of knowledge and skills using standard information transfer systems and Internet-based technologies.
6. The concept of promoting traditional environmental management practices and empowering traditional leaders to enhance the environment have been discussed at various Pacific forums for over 20 years, and have been a key part of the environmental strategies of all the countries (RMI, Cook Islands and Vanuatu) participating in the RETA for over 10 years. There have also been some very successful models of TEM (e.g. soil conservation on steep hillslopes in Papua New Guinea) already established in the Pacific, including the RMI (e.g. Canoes of the Marshall Islands).
7. Despite these successful models, the need for this project is compelling, as the state of the environment continues to decline despite legislation and various government agency and non-governmental organisation initiatives. The three participating Governments specifically endorsed the RETA as an essential activity to fill a potential weakness in environment and conservation programmes.

8. The RETA therefore had a clearly defined and relatively straightforward strategy to achieve its overall goal and objectives. Data on TEM would be collected, incorporated into educational resource material, and used to educate the community on the benefits of TEM. The traditional leaders would have a role in community education, and their status as leaders in environmental management would be enhanced.

9. The purpose of the RETA was to build the capacity of EPA staff and other key stakeholders in the community, in particular the traditional leaders, to enable the project objectives to be achieved. The project is fundamentally an environmental education project, and the desired end result (output) is education and awareness raising to produce an attitudinal change...the change (or outcome) being respect for the environment, respect for traditional environmental management systems, and respect for traditional leaders who will hopefully feature more prominently in future environmental management initiatives.

## **B. Project Rationale**

10. The traditional way of life has been, of necessity, an ecologically sustainable one, with care of the environment essential for future generations to benefit from the resources. However, the introduction of a cash economy and the need to satisfy increasing financial demands have led to increasing pressures on natural resources.

11. Environmental degradation is now becoming more visible in the urbanised areas where resource use and rapidly changing lifestyles are generating non-biological wastes such as aluminium cans, plastics, and abandoned vehicles. Solid waste accumulation is a major issue in the major population centres of Majuro and Ebeye.

12. While life skills, agriculture, and other more practical subjects are taught in schools they are generally based on the latest technological findings with inadequate emphasis on the use of traditional, ecologically sustainable techniques.

13. Indeed, awareness and understanding of the importance of traditional practices that have been a part of past generations are now disappearing due to recent sociocultural changes and modern influences. Hence, it is necessary to promote traditional environmental management by encouraging the incorporation of environmentally sustainable traditional practices with non-traditional practices.

## **C. Project Development**

14. During the initial RETA inception workshop held in Majuro during August 2000, a working group was established to define the project, develop a final work plan and implement the project. The RMI Environmental Protection Authority (EPA) was nominated by the RMI government to be the coordinating agency for the project.

15. The working group comprised members from Alele Museum, Historic Preservation Office (HPO), Environmental Protection Authority (EPA), Marshall Islands Marine Resources Authority (MIMRA), Marshall Islands Visitors Authority (MIVA),

Ministry of Finance, Ministry of Education, the NGO's Waan Aelon in Majol (WAM) (Canoes of the Marshall Islands) and Mission Pacific, and private individuals.

16. After the initial inception workshop, a series of working group meetings were conducted to define the project and plan out the project activities. As a result of a participatory process the working group decided to apply TEM to solid waste management on Majuro Atoll, and initially to focus on the most densely populated villages (Delap, Uliga and Darrit, or DUD) of the island. The reason for selecting DUD was that the problem with SWM was most severe in these areas.

17. In summary the objective of the TEM project was to raise awareness among the Majuro community and eventually the rest of the RMI on the characteristics and the appropriate management of organic and inorganic solid wastes, particularly the use of organic materials in vegetation mulches and the non-biodegradable characteristics of modern waste. The TEM project also sought to instil a sense of responsibility at all levels to initiate action from the community under the leadership of the traditional land managers (Alaps),

## **11. NATURAL RESOURCES AND ENVIRONMENTAL ISSUES**

18. The Republic of the Marshall Islands (RMI) is composed of 29 atolls and 5 low elevation islands in a relatively remote part of the north-central Pacific Ocean. A fragile ecosystem and a limited resource base (a total land area of just under 110 square kilometres) have caused the Marshallese to share a strong affinity with, and dependence on, land and ocean resources for their livelihood and economic development.

19. With a mean height above sea level of just 2 metres, the low lying atolls of the RMI are particularly vulnerable to climate change and sea level rise, which under a worst case scenario could render much of the RMI uninhabitable (RMI 1993). Increased storminess combined with a higher sea level would increase both the rate and extent of coastal erosion. Higher sea level would also reduce the available land area, the extent of arable land and the volume of the fresh water lenses.

20. Of all the islands of the RMI, only one (Mejit) has a fresh to brackish water lake. All the other islands rely on either rainwater capture or, on the larger islets, exploitation of shallow groundwater lenses. These freshwater (Ghyben-Herzberg) lenses are particularly vulnerable from over extraction (rendering them saline) and are easily contaminated. Indiscriminate waste disposal on the land has led to most of the shallow groundwater resources of the RMI becoming contaminated (RMI 1993).

21. The soils on the islands of the RMI are, for the most part, highly permeable, very low in nutrients and exhibit high surface salinity, making them generally unsuitable for agriculture. Whilst these soils may have supported various forms of vegetation in the past, no endemic species are known today. Most of the islands are presently covered in coconut palms.

22. High birth rates and inward migration from the outer islands has resulted in extremely high rates of population growth, such that the population densities of Majuro

and Ebeye are now amongst the highest in the world (RMI 1993). This rapid population growth has resulted in overcrowding in Majuro (population densities of over 2,500 per square kilometre), which is manifested in poorly constructed houses packed together without adequate sanitation and solid waste disposal.

23. The lagoon and near-shore reefs have traditionally been a major source of food and protein for the Marshallese. Destruction of the coral reefs has been occurring as a result of mining for aggregate (sand and gravel), dredging, channel blasting and boat anchoring. Coral death has also resulted from rapid algal growth arising from high nutrient loadings associated with domestic waste disposal.

24. In addition to algal growth, the lagoonal waters adjacent to urban areas of Majuro have been plagued with “red tide”, a proliferation of dinoflagellates which can threaten marine life by lowering the dissolved oxygen levels in the water and which can also render some types of seafood toxic to humans (RMI 1993).

## **111. SOLID WASTE MANAGEMENT ISSUES**

### **A. Solid Waste Disposal**

25. Traditionally, disposal of solid waste has been to ground. In the past, with low population densities and locally sourced biodegradable solid waste products, such disposal presented few ecological problems. Now however, with high population densities and each household producing significant quantities of both biodegradable and non-biodegradable solid waste, such materials are accumulating on both the limited areas of land and the marine waters at ecologically damaging levels.

26. In the RMI submission to the International Waters Project (IWP) during the 1997 formulation process, solid waste disposal was listed as the number one “major concern of marine and fresh water quality”, reinforcing the detrimental effect that uncontrolled disposal of solid waste is having on the aquatic environment.

27. In 1996 the USEPA concluded that there was a compelling need to improve waste management and disposal practices on Majuro, as the practices of disposing of solid waste in open dumps located on reef flat areas presented public health, environmental and aesthetic problems which were detrimental to the well being of the community and which could also hinder future plans to build a tourism industry.

28. This latter concern was born out recently when tourism companies operating cruise ships in the Pacific gave notice that they would by pass Majuro because of visible solid waste pollution on the land and coastal waters of Majuro. With unemployment rates on Majuro amongst the highest in the Pacific, alternative livelihood opportunities that tourism presents are important for the well being of the communities.

### **B. Land Tenure**

29. The traditional land tenure system has often constrained government led initiatives to improve the urban environment and conserve biological diversity.

Landowners have often been reluctant to accept regulations pertaining to solid waste disposal or other measures that may affect their rights to do what they want on their land. This has presented significant problems for government led initiatives to manage solid waste.

30. On Majuro, as for other atolls of the Marshall Islands, neither the RMI National Government nor the Majuro Atoll Local Government (MalGov) has any effective control over the use of land. All of the land is “owned” by the traditional leaders and is under the management of the Alaps in their respective weto’s. Government buildings are therefore located on land leased from the traditional leaders. In some cases individuals may seek residence on an Alaps land without a formal lease agreement. There is no legislation stating that leases have to be made, and verbal agreements are often sufficient.

31. Conflicts have arisen relatively recently with new government agencies such as the EPA and MIMRA, mandated under legislation to regulate marine and land use, endeavouring to exert their authority. The Alaps have viewed these agencies and their mandates as diluting their authority over these natural resources, and have resisted the imposition of government regulations. Despite the regulations, the government is powerless to prevent the location of waste stockpiles, animal pens or even graves to be located in particular areas. The traditional leaders have also seen little evidence that the government agencies themselves can effectively coordinate an environmentally appropriate solid waste management system.

### **C. Inwards Migration and Population Growth**

32. Inwards migration from the outer islands has two main adverse effects on the environment of Majuro. Firstly, the majority of migrants tend to settle with friends and relatives in the very densely populated villages of Delap, Uliga and Darrit (DUD). This results in more of the already limited land being taken up for housing, thus reducing the amount of land available for the growing of fruit and vegetables, and raising animals. This puts more pressure to import basic foodstuffs that, because of the relative isolation of Majuro, is usually canned or similarly contained.

33. Accordingly, inward migration inevitably results in an increase in the per capita amount of solid waste generated, thereby exacerbating the already serious problem of solid waste management. The lack of land available for agricultural purposes also puts more pressure on the near shore marine resources as the villages look for alternative sources of protein. Even without inward migration from the outer islands, with over 60% of the population reported to be less than 30 years of age, waste generation is predicted to grow rapidly in the coming years (RMI 2003) due to high natural population growth alone.

34. Secondly, migrants tend to treat inorganic refuse consisting of plastic, glass, and metals as if they were organic materials and discard these materials casually on the land or into the lagoon, or dispose of it in pits, as they do on the outer islands. In addition to Marshallese from outer islands, immigrants are also arriving in Majuro from many other countries. Land is being settled on, or leased to, non-Marshallese for a variety of

domestic and commercial purposes, and proper attention to appropriate solid waste management is generally not incorporated into the formal or informal lease agreements.

#### **D. Imported Goods**

35. All of the non-biodegradable, and most of the biodegradable, solid waste products on Majuro that are currently disposed of to land, or into the lagoon or the ocean, originate from somewhere other than Majuro. Because of the need to import almost all consumer and food products, containers and packaging contribute significantly to the solid waste volume. Cardboard packaging was observed to be a relatively high percentage of the biodegradable solid waste, and aluminium cans, plastic bottles and glass appeared to account for some 12-15% of the total waste stream.

36. Currently there are very few constraints on what can be imported in to the RMI, and what forms of packaging these products arrive in. Once on the islands, however, there are few incentives for their eventual removal once they have served their intended or useful purpose. Accordingly, large quantities of abandoned solid waste items are accumulating on the islands, particularly Majuro, which need to be disposed of.

37. Potentially destructive products entering the marine environment around Majuro such as plastic bags and plastic six-pack connections could easily be prohibited, as could Styrofoam packaging. Also of concern is the amount of toxic or hazardous waste that is accumulating on Majuro associated with the importation of vehicles. There is currently no programme to deal with items such as used motor oil, batteries, tyres and brake linings. In 1996 it was estimated (USEPA, 1996) that more than 800 lead-acid batteries were probably discarded annually on Majuro.

#### **E. Solid Waste Volumes**

38. The waste generation rates on Majuro, at about 1kg/person/day, appear to be much higher than other pacific island countries that appear to have stronger cultural ties and traditional lifestyles. For example, Kiribati and Apia, Samoa, have solid waste generation rates of about 0.5kg/person/day, whereas American Samoa, Saipan and Hawaii have rates similar to the US mainland, at about 2kg/person/day.

39. If the people on Majuro continue to aspire to a US lifestyle, then it is inevitable that solid waste volumes will increase. Vehicle numbers on Majuro have increased from 1800 in 1998 to over 3100 in 2002 (RMI 2003). Lead acid batteries and waste oil now pose a particular disposal problem. In 1996 the USEPA estimated that 15-20,000 litres of waste oil was generated annually on Majuro, and this did not include that produced by the diesel power plant.

#### **F. Waste Separation and Recycling**

40. Many of the wastes disposed in Majuro have a high potential for recycling. From recent investigations undertaken by the government (RMI 2003) two different types of recycling programs appear to be feasible, commodity recycling and organic waste

recycling. Commodity recycling includes food and beverage containers and organics recycling includes food waste and wood waste.

41. Paper and cardboard can be recycled either as a commodity or in an organics-recycling program. Some small-scale organic waste recycling has been undertaken at the Taiwanese experimental farm in Laura and, in the past, some research on trench composting has been done at the College of the Marshall Islands (CMI) Laura campus.

42. The government study also concluded that 50% or more of the waste stream is compostable (including the cardboard and paper) and that there are very large quantities of aluminium cans and plastic polyethylene terephthalate (PET) drinking bottles being disposed. There are very high relative percentages of cardboard in the waste because of the need to import almost all consumer and food products. The high percentage of plastic water bottles is considered to be a reflection of the poor water quality on the island.

43. To date recycling efforts have been minimal and focused on sporadic aluminium can collection at a handful of locations and a brief effort by the RMIEPA in the mid 1990's (Cans for Kids program) from which it was reported no cans were ever shipped off the island.

44. It is estimated that aluminium cans, plastic bottles and glass accounts for about 15% of the waste stream (RMI 2003). Accordingly, separating out those materials that could be recycled or composted could reduce the waste currently going to landfill by up to 65%.

#### **IV. TEM KNOWLEDGE, PRACTICES AND VALUES**

##### **A. Gathering TEM Information**

45. As a result of the TEM project, information on traditional knowledge, practices and values has been compiled from both primary and secondary sources.

46. Primary information was collected from traditional leaders at the Alaps Workshop held in June 2002. As a follow up to the workshop, a meeting of the Alaps identified as positive role models for the project has been carried out to identify traditional knowledge holders residing in their respective *weto's*<sup>1</sup>.

47. With the assistance of the Alele Museum and the Historic Preservation Office (HPO), secondary information on traditional knowledge, practices and values has been collected including Jabonkannaan, traditional conservation practices such as 'mo'<sup>2</sup> and the use of legends in traditional conservation practices (recorded on videos at Alele Museum).

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<sup>1</sup> *Weto* is a parcel of land under the direct stewardship of a specified Alap.

<sup>2</sup> *Mo* is a marine and/or terrestrial area that is set aside by a traditional leader (Iroj) as restricted 'taboo' areas.

48. Marshallese express themselves and their culture with the use of jabolnkanaan, or “wise sayings”. These sayings, or wisdom from the past, have been compiled and published and are being used to promote traditional values in environmental management. This traditional wisdom justifies certain values and solidifies customs that bind the culture together. Many of the jabolnkanaan compiled in the publication (Alele, 2000) are still observed by the Marshallese community.

## **B. Awareness Raising**

49. The working group concluded that the most effective means of raising awareness would be through the use of public awareness videos, an activity booklet, school presentations, integration of TEM into after school programs, radio spots, community meetings and workshops.

50. The TEM-project has produced resource materials for both school and community education purposes including a power point presentation on TEM and solid waste management on Majuro, a series of radio programmes and a newsletter with a number of articles focussing on TEM and the role of traditional leaders. The EPA Environmental Education Officer has been active giving TEM and SWM presentations to schools and participating in radio programmes. A newsletter has been delivered to all Government agencies, and the project has received good coverage in the Marshall Islands Journal

## **V. APPLICATION OF TEM INFORMATION TO SWM**

### **A. Composting and Mulching Organic Material**

51. The RMI TEM project sought to raise awareness of the decomposition process of various waste materials, organic components of which have been traditionally used in mulches to enhance soil fertility, and compare this process to that of non-biodegradable materials used today.

52. With the very high percentage of organic material currently being disposed of to the landfill, TEM practices of mulching and composting organic waste clearly has an application to SWM on Majuro. Firstly, however, the organic material needs to be separated from the waste stream so that this can be treated using traditional methods of disposal such as mulch and/or compost. Before this can be undertaken it is necessary to make people aware of the difference between biodegradable and non-biodegradable materials, and what materials can be recycled.

53. This necessary education process is already well underway, with the EPA Education Officer making presentation to the schools on Majuro. It will be several years, however, before the practice of composting and mulching organic material is mainstreamed into daily SWM practice at the weto level.

### **B. Waste Reduction/Minimisation**

54. The use of traditional knowledge, local materials and traditional methods of transportation can significantly reduce the amount of non-biodegradable solid waste. The

Canoes of the Marshall Islands is one of the most successful examples of traditional environmental management operating in the RMI, if not the Pacific, and one that the traditional leaders have now picked up on throughout the islands of the Marshalls.

55. The WAM project teaches young Marshallese how to build and sail traditional outrigger sailing canoes from locally available trees. By utilising materials that are for the most part renewable and biodegradable, the WAM project results in less importation of alternative materials such as fibreglass and aluminium. By maintaining traditional knowledge and utilising a sustainable form of transport (wind power), the WAM project also reduces the amounts of fuel, fuel containers and outboard motors coming into the RMI, most of which eventually require disposal.

56. Traditional practices of growing fruit and vegetables can also reduce the amount of imported canned food being brought in to Majuro, with the attendant need for later disposal of the packaging materials and the food containers.

### **C. Collaborative Approach to SWM**

57. Jimor Wodjipel Ra eo Bunwoj, or “spirit of coming together for a common cause which is the responsibility of all” is a saying that encourages unity of the people for the sake of the common good. This saying is particularly relevant to SWM by reinforcing the fact that the protection of the environment and responsibility and the management of the natural resources of the Marshall Islands is the responsibility of everyone. Accordingly, by resurrecting the traditional values espoused in the Jabonkannaan, or wise sayings, the community should be able to take collective responsibility of dealing with the problems of solid waste accumulation on Majuro, under the leadership of the Alaps.

58. The TEM values to be mainstreamed into everyday usage is therefore community unity. The role of the traditional leaders being promoted are to encourage the spirit of togetherness in dealing with the solid waste problem. The traditional leaders would also have a re-instilled sense of responsibility for the wellbeing of the people. The traditional leaders would therefore act as spokespersons for solid waste management at the weto level, and become role models for the community. The traditional values of working together for the common good should be able to ensure that the environment is not polluted by the indiscriminate disposal of solid waste.

59. It may be entirely coincidental but at the debriefing meeting at the completion of the project villagers were observed picking up refuse, and most of the Wetos in Majuro appeared to be cleaner now than at the commencement of the project.

## **VI. INVOLVEMENT OF THE TRADITIONAL LEADERS IN SWM**

### **A. Land Tenure**

60. The traditional roles of the Alaps have not changed, but with the rise of government the traditional leaders have tended to become marginalized in the decision making process. The TEM project has provided a platform for the traditional leaders to not only to work through the various land tenure and resource management issues with

government, but has also provided the leaders with a key role in environmental management. The very extensive and positive publicity that the Alaps have received as a result of the RETA implementation has provided renewed respect for both the leaders and the traditional values of working together for the common good.

61. With the land tenure system and the traditional leadership structure, the support of the traditional leaders is essential for the successful implementation of any SWM initiative. As the traditional managers of the land, the Alaps have the ultimate authority over all of the land, and the disposal of waste products on it. If land needs to be set aside for collection and disposal purposes, then only the traditional leaders can make the necessary arrangements. As a result of the TEM project the Alaps have agreed to make the necessary land available for SWM purposes.

## **B. Respect for Traditional Leaders and Values**

62. The Alaps Workshop was a key milestone in the TEM project. The workshop was very well attended by the Alaps of Majuro, and the working group members acted as facilitators. For EPA the highlight was hearing the traditional leaders affirm that they are 100% behind EPA in their efforts to improve the environment, and that they (the Alaps) will work with EPA to effect improved SWM on Majuro. There had previously been a feeling by at least some of the Alaps that the EPA was trying to assume control of the natural resources, but that they now realised that together they had a role in natural resources management and would support each other.

63. It is clear that the TEM project has improved the status and morale of the traditional leaders of Majuro, and the knowledge of both the leaders and the community has been enhanced as a result of the meetings, workshops and powerpoint presentations undertaken by a strengthened EPA. As a result of the TEM project, the traditional leaders have assumed a key role in environmental and solid waste management initiatives.

64. Many of the education materials produced under the RETA have already been utilised as part of the awareness-raising component of the project. The Iroj and Alaps have had their awareness raised through meetings and powerpoint presentations, and as a result of a workshop the Alaps have produced their own SWM action plan.

## **C. Integration of TEM into SWM Strategies**

65. TEM related aspects have been incorporated into many of the strategies to achieve several key objectives relating to SWM in the latest 15 year RMI National Strategic Plan, Vision 2018 (2003-2018).

66. For example, strategies to promote a clean environment include the establishment of policies to minimise the use of non-biodegradable packaging, the encouragement of activities aimed at landscaping and beautifying urban centres through active involvement of Traditional Leaders and landowners, and the strengthening of public awareness programmes aimed at community education

67. Strategies to enhance the level of awareness and commitment among all people in the community to contribute towards the minimisation of environmental degradation include the documentation and incorporation in school curricula traditional knowledge and public education aimed at keeping the environment clean.

68. Strategies for reinvigorating RMI cultural and traditional environmental conservation practices to harmonise development with environmental sustainability include the identification and revitalisation of the specific environmental practices, methods and sites, and the establishment of effective ways and means of promoting greater awareness and enforcement of traditional conservation practices.

69. The TEM project has therefore already had a significant impact by incorporating TEM into policy review, formulation and implementation as seen in the new Strategic Plan for the RMI. The active involvement of traditional leaders is formally recognised by the RMI government in the Vision 2018 strategy.

70. There is also evidence that the government is including the traditional leaders in its new SWM initiatives. At the Multi-Agency Strategic Planning Workshop for SWM held in Majuro during 14 and 15 May 2003, the traditional leaders were not only represented and are also part of the established working group to take the plan forward. The traditional leadership has therefore been effectively integrated into the SWM planning process.

71. The TEM project represents only a very small, albeit vital, step in solving the solid waste problems on Majuro. There are also many SWM issues that TEM cannot address. Linkages with other SWM projects that can address the issues that are beyond the scope of TEM are therefore essential if progress is to be maintained.

## **V11. SWM ISSUES THAT TEM CANNOT ADDRESS**

72. Before being disposed of, non-recyclable and non-biodegradable products need to be taken to collection points for ultimate disposal elsewhere. The current collection system consists of seventy 20 cubic metre roll off bins placed strategically around the island of Majuro. These 70 bins are currently serviced by just two trucks, and even with collection operations being maintained for 14 hours a day, six days a week, bins are often full resulting in solid waste being disposed of on to the ground nearby. Whilst TEM can reduce the amount of material going to the bins, the operational aspects need to be coordinated by government (both national and MalGov) in association with the traditional leaders.

73. Once on Majuro, products that cannot be composted or recycled must be disposed of through incineration and/or landfilling on-island, or transported off-island for disposal elsewhere. The design and operation of a safe and sanitary landfill and/or incinerator requires the application of new knowledge and skills. As with the collection of the solid waste, the siting and method of disposal needs to be coordinated by government (both national and MalGov) in association with the traditional leaders.

74. As TEM knowledge, practices or values cannot directly address the collection and disposal of non-biodegradable products, or hazardous waste, it is therefore necessary to give special consideration as to how particular materials are to be ultimately disposed of before they are imported to Majuro. This process may ultimately lead to a ban of particular materials being imported, or at least the removal of packaging at source. This is clearly a major issue that needs to be addressed by the national RMI government in association with the Majuro community.

## **V111. CONCLUSIONS AND RECOMMENDATIONS**

75. The solid waste disposal on Majuro is one of the most pressing environmental problems in the RMI, brought about by increasing population pressures, changing lifestyles and very limited land available for SWM purposes. TEM knowledge, practices and values have clear applications to addressing some of the SWM issues on Majuro, as does the involvement of the traditional leaders.

76. Solving the problems of solid waste on Majuro will not occur without a concerted and coordinated multi-sectoral approach. The use of multi-sectoral working groups or community groups to address environmental problems one of the lessons learned from the review of the NEMS, where the lack of progress with the NEMS implementation was considered to be due in large part because one agency alone (typically the RMI EPA) was seen as being responsible for project implementation. The use of a multi-sectoral working group to define and implement the TEM project enabled the workload to be spread amongst the key stakeholders.

77. Perhaps even more importantly, the use of a multi-sectoral working group reinforced the concept that responsibility for environmental protection and enhancement is one shared by all, and not the responsibility of one government agency with limited financial and human resources. The lesson is therefore to use multi-sectoral or community groups to address environmental problems wherever possible, and this is clearly essential for SWM on Majuro. The TEM working group could be expanded and continue to address the SWM issues on Majuro.

78. The ADB and SPREP supported TEM project appears to have been highly successful in terms of raising the profile of traditional leaders and initiating discussions on how the role of traditional leaders may be integrated into current decision-making systems with respect to SWM on Majuro. In the RMI the issue of merging the customary land-ownership issues with government-enforced regulations has been one that the country has grappled with for some time.

79. This TEM project has enabled the establishment of a “legitimate” platform for discussions on the issue, using solid waste management as an example. As the land managers, the Alaps have a critical role to play in solid waste management on Majuro, where indiscriminate disposal of solid waste to land and sea has been occurring for decades. This is now recognised by the Alaps who have prepared their own solid waste management action plan and are looking to form an association to better promote their role in environmental management overall. The Alaps have also agreed to make the necessary land available for solid waste management purposes.

80. Major attitudinal changes appear to have already come about as a result of the project, and the key project objectives have been more than met. Under this project the RMI has taken a major step forward in mainstreaming TEM, at least on Majuro, in the area of effective solid waste management. As a result of the project, the traditional leaders and the various government agencies and non-governmental organisations have become united in their efforts to solve the solid waste problems on Majuro.

81. Educational initiatives have commenced which could lead to the amount of solid waste being reduced by up to 65% through composting and recycling. Coupled with education on growing fruit and vegetables with the mulch and compost, this could also lead to a reduction in food importation and its containment and packaging, further reducing the amount of solid waste generated.

82. Traditional knowledge must be maintained, in programmes such as the Canoes of the Marshalls, if the importation of alternative products is to be minimised. As a working example of the utilisation of traditional practices for the sustainable use of natural resources, and a project which utilises renewable and biodegradable materials wherever possible, the Canoes of the Marshall Islands project is an excellent model which should be actively supported.

83. Traditional practices, such as the mulching and composting of organic materials, must be encouraged in order to reduce the amount of waste requiring disposal to landfill and enhance the fertility of the soils. This will in turn allow the growing of fruit and vegetables locally.

84. Traditional values, espoused in sayings such as the spirit of coming together for a common cause, are necessary to reinforce the fact that the protection of the environment and responsibility and the management of the natural resources of the Marshall Islands is the responsibility of everyone. Accordingly, by resurrecting the traditional values espoused in the Jabonkanaan, or wise sayings, the community should be able to take collective responsibility of dealing with the problems of solid waste accumulation on Majuro, under the leadership of the Alaps.

85. Although vital, the TEM project represents only a very small step in solving the solid waste problems on Majuro. Linkages with other SWM projects are therefore essential if progress is to be maintained.

86. There is, however, a vast quantity of solid waste such as old cars, tyres, and derelict machinery littering the atoll that will make it difficult to see the benefits of improved solid waste management at the weto level. This is not restricted to Majuro, or the RMI, and its collection and disposal off island could form the basis of a separate RETA for the populated atolls in the Pacific.

87. TEM will not, on its own, solve the problems of solid waste on Majuro. However, any solution will only come about with the active cooperation and support of the traditional leaders. Wisdom from the past will also inevitably figure very prominently in addressing the solid waste problems of the present and the future on Majuro.

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