

**Identification of Existing Barriers to the
Provision of Effective Solid Waste
Management Services within the Maldives
and Recommendations for their Removal**

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Ministry of Home Affairs and Environment

Acronyms and Abbreviations

ADB	Asian Development Bank
ADC	Atoll Development Committee
C&D	Construction and Demolition
EPPA	Environmental Protection and Preservation Act (Law No: 4/93)
ES	Environment Section
GoM	Government of the Maldives
IDC	Island Development Committee
JICA	Japan International Cooperation Agency
MAD	Ministry of Atolls Development
MARPOL	International Convention for the Prevention of Pollution from Ships
MCPW	Ministry of Construction and Public Works
MCST	Ministry of Communications, Science and Technology
MHAE	Ministry of Home Affairs and Environment
MM	Municipality
MoFAMR	Ministry of Fisheries, Agriculture and Marine Resources
MoH	Ministry of Health
MoT	Ministry of Tourism
MPND	Ministry of Planning and National Development
NDR	Northern Development Region
NGOs	Non-Governmental Organisations
NSWMP	National Solid Waste Management Policy
PSIP	Public Sector Investment Programme
RDPMO	Regional Development Project Management Office
Rf	Maldivian Rufiya
SDR	Southern Development Region
SWM	Solid Waste Management
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WDC	Womens Development Committee

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Executive Summary

The UNDP funded consultant, Mr. Michael Cowing, undertook a mission in the Maldives from 15th February to 5th March 2004, with the specific objective of developing the framework for the future development of a National Solid Waste Management Policy (NSWMP). Further, existing barriers preventing the delivery of efficient waste management services were identified, and appropriate interventions recommended for their removal.

In summary, a broad framework for the NSWMP has been developed and has received broad approval from representatives from all key stakeholders through a series of consultations, meetings and presentations.

The following factors were identified as being the major existing barriers to delivering efficient waste management services within the Maldives. It should however be noted that the levels of waste management services are far higher in Male' than in the outlying atolls and islands:

1. The pressing need for greater levels of government investment in waste management infrastructure and equipment within the inhabited atolls and islands. Clearly, this is not a problem within the resort islands, although there are concerns about the design and age of some of the equipment, such as the incinerators, and some of the prevailing practices such as dumping food waste into the marine environment;
2. This lack of investment within the waste infrastructure within inhabited islands is exacerbated by, or is possibly a function of, an absence of appropriate cost recovery mechanisms throughout the sector;
3. Inadequate institutional capacity and financial resources within key government agencies resulting in an inability to fully execute mandated responsibilities;
4. The absence of a national waste management policy resulting in a lack of clear roles and responsibilities, leadership and co-ordination;
5. Inadequate level of education and awareness raising resulting in low levels of compliance from the public, coupled with uncertainty about available options and best practices;
6. Weak legislative and regulatory framework which hinders effective monitoring and enforcement; and
7. The limited involvement of the private sector in service delivery resulting in opportunities to improve efficiency and reduce costs not being fully realised.

Actions and interventions for addressing these main barriers are provided within the report. However, for this initiative to be successful, it is recognised that there is a pressing need for the Government of the Maldives (GoM) to enhance the capacity of the Environment Section (ES) within the Ministry of Home Affairs and Environment (MHAE) and by making additional funding available for waste management infrastructure, which can be complemented by counterpart contributions by the recipient communities.

1 Situation Analysis

1.1 Project Rationale

The Maldives is located in the Indian Ocean, approximately 600 km southwest of Sri Lanka. The country comprises a chain of 1,192 coral islands, spanning a maritime area of 859,000 km², with a total land area estimated to be 300 km².

According to Census 2000, the population of the Maldives is in the order of 290,000, of which some 75,000 live in the capital Male'. However, the country's natural resources and infrastructure are further challenged by the numerous tourists who visit the country, estimated to be in excess of 500,000 each year.

In recent years there has been a significant increase in the magnitude of waste management problems throughout the Maldives for a number of reasons, including, but not necessarily limited to: the small size of the island; the rapid growth in population; changing consumption patterns; transportation difficulties, coupled with the environmental challenges brought about by the growing tourism industry.

This worsening waste management situation is increasingly resulting in pollution of the environment, and the generation of conditions prejudicial to public health. Further, if unchecked, the worsening waste management situation may ultimately threaten the economic development of the country, which is intrinsically linked to the tourist and fishing industries.

Tackling these growing waste management problems has become fundamental to the promotion of sustainable development. Consequently, a number of studies, and consultancy inputs, have been undertaken in recent years. However, these have tended to be somewhat uncoordinated as they have been commissioned by various agencies, and have focused upon waste management issues within specific areas such as Male', atolls or individual islands rather than looking at the national picture. Further, they have tended to focus very much on 'end of pipe' solutions, dealing primarily with waste disposal rather than waste prevention and minimisation.

Therefore, the government has recognised the need to address the waste management issues in a more integrated, comprehensive fashion. Hence the desire to develop an integrated NSWMP which will seek to undertake the following:

- ◆ Identify and address all existing barriers within the waste management sector;
- ◆ Allocate priority tasks; and
- ◆ Clarify roles and responsibilities.

To ensure that the NSWMP is properly implemented and monitored it will be necessary to identify and strengthen a single government institution that will have overall responsibility and the necessary level of resources. It is reported by some entities, such as the Ministry of Atolls Development (MAD), that the Environment Section within the Ministry of Home Affairs and Environment (MHAE) has been given a clear mandate for waste management. However, the consultant is of the opinion that the Environment Section presently lacks sufficient human or financial resources to adequately satisfy this mandate.

Ultimately, the NSWMP will need to provide mechanisms to manage waste from the point of generation through to final disposal, often referred to as the 'cradle to grave' concept. In conjunction with this approach, a more effective, integrated approach to material and resource efficiency is needed at every stage of utilisation and consumption.

1.2 The Current Situation

The status of waste management service within Male' and the outlying inhabited atolls and islands has been well documented in various domestic and international studies including, but not limited to, the following:

1. Atoll Development Committee, Ari Atoll, October 2003, Management of Solid Waste in Ari Atoll;
2. Ministry of Home Affairs and Environment, December 2003, Pre-Feasibility Study on the Enhancement of Waste Collection Systems in Maldives;
3. Mpungu, J.D, September 2003, Solid waste Disposal Management Paper: Vaavu Atoll;
4. UNDP, 2002, State of the Environment, Noonu Atoll;
5. Halliburton KBR Pty Ltd, February 2002, Strategy for Solid Waste Management in Vaavu and Baa Atolls, Maldives;
6. MacAlister Elliot & Partners, January 2001, Addu Atoll (SDR) and Kulhuduffushi (NDR) Solid waste Management Strategy;
7. Ministry of Home Affairs, Housing and Environment, 2001, Successful Solid Waste Management Systems of the Maldives;
8. Japan International Cooperation Agency (JICA) 1999, Study on Solid waste management for Male' City in the Republic of Maldives.

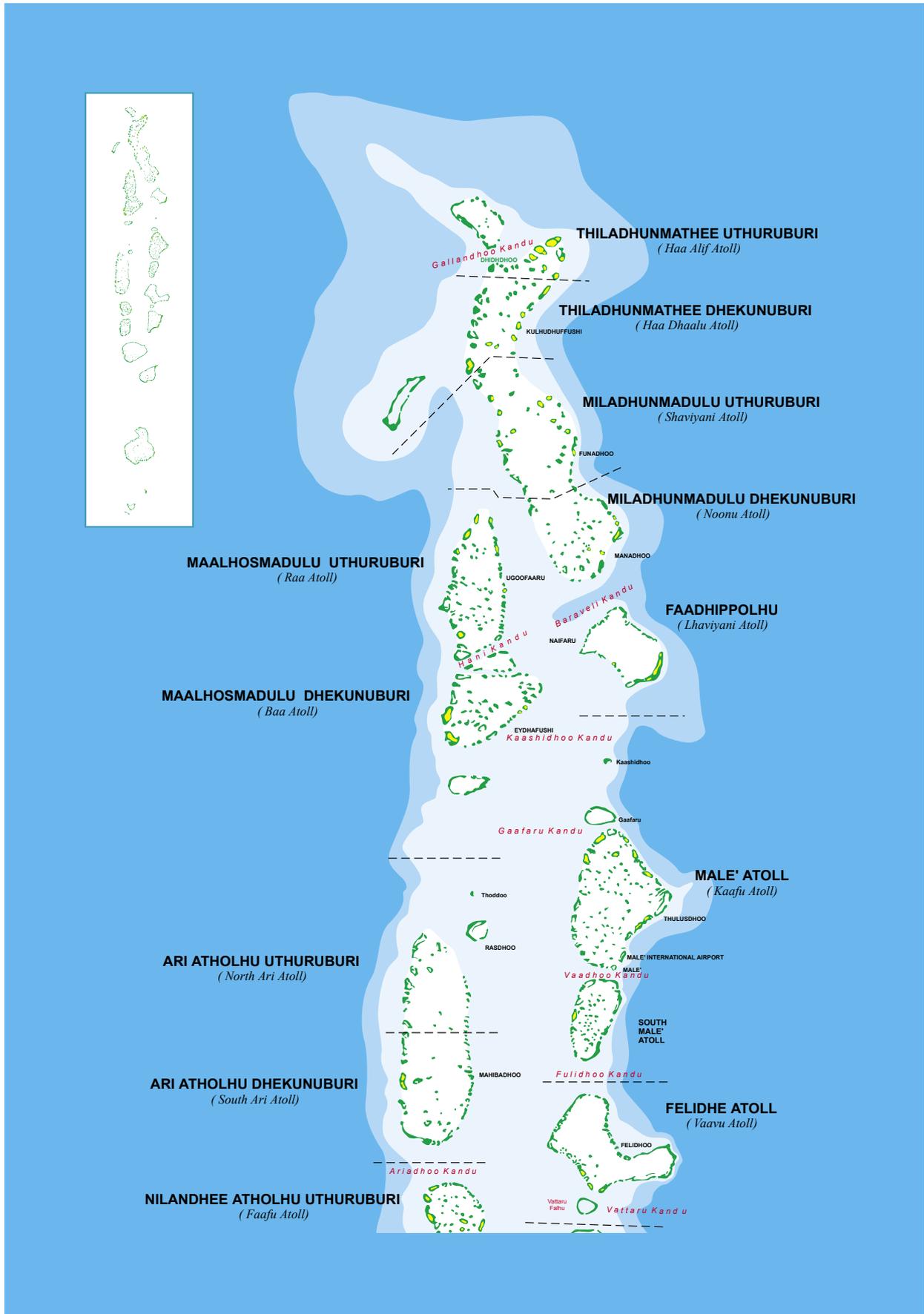
These documents, and others, have been reviewed by the consultant and information contained therein has been supplemented by a series of island visits, where site inspections were undertaken in conjunction with consultations with key stakeholders. The islands visited comprise:

1. Felidhoo, Vaavu Atoll (V.Felidhoo);
2. Dhiggiri, Vaavu Atoll (V.Dhiggiri);
3. Velidhoo, Noonu Atoll (N.Velidhoo);
4. Holhudhoo, Noonu Atoll (N.Holhudhoo);
5. Manadhoo, Noonu Atoll (N.Manadhoo);
6. Funadhoo, Shaviyani Atoll (Sh.Funadhoo); and
7. Kulhudhufushi, Haa Dhaalu Atoll (H.Dh.Kulhudhufushi).

Some ninety (90) stakeholders participated in consultations on the islands visited, representing the following groups and organisations:

1. The Atoll Office and Atoll Development Committee (ADC) (if located within the particular island being visited);
2. The Island Office;
3. The Island Development Committee (IDC);
4. The Women's Development Committee (WDC); and
5. Other local NGOs.

The following three boxes present a summary of the key factors, concerns and difficulties as they relate to the provision of waste management services within Male', the inhabited islands and the resort islands.



Box 1.1 The Current Situation in Male'

Waste Collection

1. Household waste is delivered to two roadside containers (skip bins) or directly to the dedicated waste transfer station in Male'. Delivery of this waste to these sites is undertaken either directly by the householders, Male' Municipality (MM) or private operators;
2. A fee is charged by MM and the various private contractors for collection services. Alternatively, householders can deposit their waste within the roadside bins or at the transfer station free of charge.;
3. MM's vehicle fleet is old, and they are experiencing difficulties obtaining spare parts. Therefore, greater emphasis is now being placed on the householders carrying their waste to the transfer station, either by themselves or via private contractors;
4. The private contractors are largely unregulated, have not participated in an open bidding process, and are not provided with contracts by MM; and
5. Construction and Demolition (C&D) waste is deposited at a second dedicated transfer station. Despite the considerable volume of waste and the significant problems associated with its transportation and disposal, no fee is levied for this service.

Waste Disposal

1. The Ministry of Construction and Public Works (MCPW) removes waste from the waste transfer stations and barge it to the waste disposal site (a municipal landfill) on the island of Thilafushi. Household waste is transported in large static compactor units, while C&D waste is transported by tipper trucks;
2. The annual budget for these activities is reported to be some Rf10 million/year;
3. Despite the generally high standard of operations undertaken by MM, considerable smoke and odour nuisances are created from the open burning of waste at the Thilafushi site;
4. In the absence of any composting initiatives, green and organic waste is routinely burnt;
5. Windblown litter, such as plastic bags, packaging and paper, enter the marine environment; and
6. No regular monitoring is undertaken to determine the impact of leachate upon the marine environment.

Box 1.2 The Current Situation within the Inhabited Islands

Waste Collection

1. Generally, there is little provision of waste collection services throughout the islands. Consequently, householders are required to carry their waste to disposal sites, which often results in informal dumping and burning being undertaken, particularly on larger islands where the sites may be some distance from the householders;
2. Where waste collection services have been introduced, such as in H.Dh. Kulhudhufushi, the cost is often too expensive for average householders, thus the service is not utilised, or is undercut by other unofficial operators offering cheaper rates;
3. There is little, if any, waste segregation practiced at the household level;
4. On the island of V.Felidhoo, a community initiative, supported by UNDP funding has produced positive results, one of which is the substitution of plastic shopping bags with locally produced cloth bags which can be washed and repeatedly reused; and
5. The WDCs are generally active sweeping and cleaning public places, but often their task is hindered by a lack of resources. For example, it was reported on a number of islands that they have to use their own funds to pay for the waste, which they accumulate through their cleansing activities, to be transported to the designated disposal sites.

Waste Disposal

1. There is an overall lack of funding in waste management infrastructure which results in a general absence of designated waste disposal sites. Normal practices would be to burn, or dump waste in the bush or the sea;
2. Existing waste disposal sites are often inappropriately located, often too close to the shoreline. As a consequence, windblown litter, such as plastic bags, packaging and paper, frequently enter the marine environment;
3. Further, the uncontrolled discharge of leachate into the marine environment is an invariable consequence of poor site location and management;
4. Burning of all combustible wastes is routinely practiced resulting in smoke nuisance to residents and, on occasions, tourists. Further, it is observed to damage roots, causing vegetation die-off and accelerated coastal erosion;

5. A number of islands have started to replace these old sites with new, engineered facilities, such as the island of N.Velidhoo. However, such sites lack any waste processing equipment such as compactors or shredders, and wholesale burning is still routinely practiced;
6. Although non-combustible materials such as glass and metal were being segregated, there was little understanding of what could ultimately be done with the material. Further, stockpiled material was accumulating water and was encouraging the breeding of mosquitoes which were reported to be affecting local households. Processing of these items would alleviate this problem; and
7. Only on the island of H.Dh.Kulhudhufushi has a new site been provided with processing equipment such as a bulldozer, tractor, shredder, and baler. It is reported that waste processing equipment has been provided within Seenu Hithadhoo (S.Hithadhoo). However, the site within H.Dh.Kulhudhufushi is rather over designed and specified and as a consequence has an extremely high operating cost. The Northern Regional Development Project Management Office (RDPMO) hopes to cover costs through the leasing out of equipment, such as the tractor and the suction tanker, but it is considered unlikely that these potential sources of funds will prove to be sufficient.

Box 1.3 The Current Situation in the Resort Islands

Due to serious time constraints during the consultant's brief mission, it was only possible to visit one resort island - Dhiggiri, Vaavu Atoll. Further, no reports or plans related to waste management issues within resort islands were available for review by the consultant. Therefore, the following observations are based upon only limited field observations which were, however, supplemented by a number of meetings with senior officials within Ministry of Tourism (MoT) and other relevant agencies.

Waste Collection

1. Generally, there are no problems related to the collection of waste within the resort islands, due largely to their small size and the limited number of waste generators.
2. Resort staff regularly collect solid waste from the sources of generation, such as the guest rooms, restaurants and public areas.

3. Further, beaches and open areas are swept on a daily basis to keep them free of litter.
4. Most, if not all, resorts have a central waste handling area where the various waste categories are sorted for processing and final disposal.

Waste Disposal

1. All resorts are required, under their operational licence, to have appropriate waste treatment equipments such as bottle crusher, metal compactor and incinerator. However, it is broadly recognised that the existing incinerators are less than optimal for the job as their original design and specification was for use on marine vessels. Consequently, they are often of insufficient capacity to deal with the volume of waste generated, particularly on the larger resorts.
2. In addition to their questionable design and capacity, a number of the incinerators presently in use are coming to the end of their operational life and need replacing. It is reported that these factors have combined to create localised nuisances to tourists relating to smoke, and odours on some resorts.
3. Food waste, generated within the kitchens, restaurants and bars is routinely disposed of at sea. This practice is usually undertaken at night, to minimise concerns to the tourists, and usually some distance from the island, although this does not appear to be a specified requirement.
4. Further, there does not appear to be any requirement for the food waste to be ground-up or macerated prior to dumping at sea, to enhance its dispersion. This is a standard requirement, under MARPOL, for boats and off-shore structures.
5. Other waste, such as packaging, metal containers, and green waste generated from maintaining the grounds, is transported by boat, often on a daily basis, to the central disposal site on Thilafushi. A charge is paid at the disposal site which relates to the size of the vessel carrying the waste.
6. Presently, opportunities for the composting of organic waste and the recycling of certain waste materials have not been explored or promoted.
7. Inspections are undertaken by officers of the MoT to ensure that individual resorts comply with licence conditions and specifications. It is reported that each resort is visited on at least an annual basis. Clearly, from an environmental perspective, a greater frequency of inspection would be desirable. Quarterly inspections would be the desired minimum frequency.

1.2.1 Summary of Key Issues from Island Consultations

1.2.1.1 Felidhoo, Vaavu Atoll

	Waste Collection	Waste Disposal
Positive Factors with Existing SWM System	<p>Householders have been discouraged from using plastic bags through a community training initiative, supported by UNDP funding. Each house was provided with locally produced cloth shopping bags to replace plastic bags, which can be cleaned and re-used.</p> <p>Following the UNDP assisted community initiative, it is reported that there is generally a high level of public awareness and compliance regarding waste issues.</p> <p>Local NGO assists with waste related issues such as cleaning lagoon and fishing industry waste from around the beach areas.</p> <p>Householders are encouraged to segregate waste, and there is some use of kitchen waste as compost at the household level.</p>	<p>Activities at the disposal site are overseen by the WDC.</p> <p>Non combustible wastes, such as metal containers and glass are separated, bagged and stockpiled for annual transfer to Thilafushi Site, at an approximate annual cost of Rf 30,000 – which is provided by MAD.</p>
Main Problems with Existing SWM System	<p>No reported or observed difficulties with waste collection services.</p>	<p>The island's one disposal site is located on the beach. Although a wall, constructed of cement filled bags, exists, it does not prevent litter from blowing into the marine environment, nor leachate discharge.</p> <p>Burning of waste is routinely practiced at the site. Separate container for disposable nappies is provided. However, burning causes smoke nuisance to the local residents.</p> <p>No permanent staff are employed at the disposal site. The WDC try to oversee activities, but with limited resources.</p>
Comments on Proposed National SWM Policy	<p>The participants viewed the formulation of a national policy as a positive development.</p> <p>They are receptive to the idea of greater assistance between the islands to tackle their waste management problems.</p> <p>For their future waste disposal activities, they are not sure what other options they have as they are short of funds, resources and available land.</p> <p>They are prepared to introduce a small fee to cater for staff at the disposal site.</p> <p>Tourists visit the island each week from the nearby resort. They would consider charging a tourist fee to help towards meeting their waste management costs.</p>	
Request for Future Assistance	<p>Would like to gain an understanding of how other islands manage their waste problems.</p> <p>Would like to receive technical training in handling/processing of various waste streams, in addition to training in composting.</p> <p>They require assistance from government regarding the cost of purchasing treatment equipment such as crushers and chippers.</p>	

1.2.1.2 Velidhoo, Noonu Atoll

	Waste Collection	Waste Disposal
Positive Factors with Existing SWM System	<p>Most householders, especially those in reasonable proximity to the disposal site are prepared to take their own waste to the site, primarily utilising wheelbarrows.</p> <p>Further, houses that are located some distance from the disposal site do have the option of using a waste collection service provided by one private vehicle.</p>	<p>The island has an extremely good engineered disposal site provided with following facilities.</p> <ol style="list-style-type: none"> 1. Concrete walls, wire fence and lockable gates; 2. Designated places for separate storage of non-combustible waste streams; 3. A raised metal structure for burning of combustible waste. <p>Two staff are provided, on a full time basis to operate the site. Their tasks include segregation of waste into separate locations of the site, and burning the combustible component of the waste stream.</p> <p>It is reported that householders are willingly participating in the payment of a waste disposal fee.</p>
Main Problems with Existing SWM System	<p>The two original waste disposal sites have been closed, and activities consolidated into one new disposal site. This means greater distances to transport waste to the site for many households. Only one vehicle available for collection services, but fee of Rf 30/month is reported to be too high for most houses. Thus, high incidence of illegal dumping.</p> <p>Representatives from the island office report that it is difficult to prosecute offenders, and fines too are too small at Rf 10. Consequently, there has been only one case of an individual receiving a fine. Rather, they prefer to try to talk to people to improve practices. This approach has had only limited success though.</p>	<p>All combustible waste is burnt at site, including green waste and plastics. This represents a waste of resources with the green wastes, and causes smoke nuisance to nearby houses.</p> <p>Segregated non-combustibles, such as metal and glass are stockpiled, but here is little understanding as to what the options are regarding treatment and recycling. Further, water accumulates within the containers and is causing problems mosquito breeding.</p>
Comments on proposed National SWM Policy	<p>Participants were generally positive to the idea of a national waste management policy.</p> <p>However, concerns were raised that it would fail to take into account the specific needs and conditions within the islands, and would be applicable only to Male'.</p> <p>Further concerns were raised about the fact that in Male' householders were not required to pay for waste disposal activities but that they in the islands were being requested to do so – this seems unfair. However, it was noted that residents of Male' do have to pay for waste collection provided by either MM or private contractors, if they chose to utilise these services. Householders in Male' do have the option of taking their waste directly to roadside containers or to the waste transfer station free of charge.</p> <p>There was a positive response to the idea of composting and to try recycling initiatives via Thilafushi, if appropriate equipment could be provided by the government due to the low income and resource base of the island.</p> <p>Householders are willing to pay small fee for improved services.</p>	
Request for Future Assistance	<p>Funding for the provision of waste processing equipment for compacting waste containers and shredding green waste for composting. Considered that it is not possible for the islanders to fund these themselves.</p> <p>Disposal guidelines to outline best practices for the various waste streams.</p> <p>Strengthening of the law as it relates to fines and enforcement mechanisms and practices.</p> <p>Measures to assist with greater information sharing with other islands.</p>	

1.2.1.3 *Holhudhoo, Noonu Atoll*

	Waste Collection	Waste Disposal
Positive Factors with Existing SWM System	<p>Householders generally transport their waste to the disposal site. The Island Office report that they have little problems regarding illegal dumping.</p> <p>One pick-up vehicle provides collection services for those houses far from the site at a fee of Rf 15/ month, which was generally felt to be affordable.</p> <p>The WDC is actively involved in the sweeping of public areas.</p> <p>Some existing re-use of waste materials is practiced, such as large tins for storage purposes, and some aluminum is melted down to make kitchen items.</p> <p>Further, some composting of kitchen waste is undertaken at a limited number of houses – guided by a booklet circulated by the Ministry of Fisheries, Agriculture and Marine Resources (MoFAMR).</p>	<p>Progress has been made regarding the allocation of land for the location of a new disposal site. It is reported that the new location takes into account prevailing wind directions and should minimise smoke problems.</p> <p>The development is being financed through a combination of community funding and Canadian funding, sourced through UNDP.</p>
Main Problems with Existing SWM System	<p>No significant problems were reported. It appears that the residents are responsible in their activities, and the collection service is well utilised and affordable.</p> <p>No household segregation of waste streams is currently practiced.</p>	<p>Officials report that the island suffers from a lack of available land for waste disposal activities.</p> <p>There is very limited control over activities at the existing site as no staffs are provided.</p> <p>Presently, there is no sorting of waste, as it is all burned at the present beach site. Problems regarding smoke from local residents are reported.</p> <p>It was observed that present practice of burning of waste is damaging tree and vegetation roots in the immediate vicinity.</p> <p>Burning of considerable quantities of green waste is wasting opportunities to re-use/ compost the material and it is reported that considerable quantities of fertilizers are imported from Male' at considerable cost.</p>
Comments on Proposed National SWM Policy	<p>Participants at the consultation meeting were pleased with the idea of a national policy to help them tackle their existing waste management problems.</p> <p>However, there was a general concern that the policy would be developed in Male' and would fail to take into account their special needs and requirements.</p> <p>Would welcome composting of green waste, as presently, fertilizer is brought in from Male'.</p>	
Request for Future Assistance	<p>Requests were made for training and assistance in the following:</p> <ul style="list-style-type: none"> Greater public awareness; Appropriate waste disposal options for various waste streams. Composting of green waste; Disposal site management; Health and safety for staff and public. <p>In addition to the above training, central government funding was sought for the provision of waste processing equipment as it was felt to be too expensive for the community to self-finance.</p>	

1.2.1.4 Manadhoo, Noonu Atoll

	Waste Collection	Waste Disposal
Positive Factors with Existing SWM System	<p>Presently, there appears to be little difficulties regarding waste collection as householders have the choice of two disposal sites. Householders were observed to transport their waste, primarily in wheelbarrows.</p> <p>Some limited composting of kitchen waste is reported to be undertaken by women at some households.</p> <p>The WDC is active in sweeping and cleaning of public areas.</p>	<p>The two existing disposal sites appear to be well utilized by the public, with little evidence of dumping of waste elsewhere.</p> <p>New waste disposal site is under construction. It will be a walled structure, with waste separation, similar to the site on N.Velidhoo.</p>
Main Problems with Existing SWM System	<p>Presently, no vehicles are available to provide a collection service.</p> <p>Problems are anticipated when they consolidate disposal activities into one site as this will mean a considerable distance for houses located furthest from the site. To avoid illegal dumping of waste, the Island Office is anxious to provide a collection service. They have a pick-up that could be made available for this practice, but would have to employ a driver, which they do not have the funds to do (some Rf 2,000/month).</p> <p>Where illegal dumping does occur, or other examples of non-compliance are undertaken, the representatives of the Island Office feel that they lack the authority to undertake corrective measures. In the absence of fining offenders, they try to talk to people to improve the level of compliance.</p>	<p>The present sites lack any management.</p> <p>They are large, ill-defined sites and have spread considerably into the surrounding bush. Burning of waste is initiated by the public.</p> <p>Presently, there is no segregation of waste undertaken. All combustible waste is burnt.</p> <p>The Island Office are considering implementing a waste fee of Rf 5-10/month to cover additional site staff fees, but doubt whether they can raise sufficient funds this way.</p>
Comments on Proposed National SWM Policy	<p>Although, viewed as a positive development, they question how relevant a national waste management policy would be to them on the island.</p> <p>They are prepared to try recycling, with recyclable materials being bulk transferred to Thilafushi but are not sure if it can work.</p> <p>Further, they lack the resources to purchase processing equipment, so would require central government assistance to achieve this.</p> <p>The island is looking to considerably extend agricultural practices on the island, so are keen on the concept of composting.</p> <p>Without greater focus on raising public awareness and stronger enforcement they are not sure a policy can be implemented.</p>	
Request for Future Assistance	<p>The participants at the consultation meeting identified the following as areas for assistance:</p> <ol style="list-style-type: none"> 1. Public awareness training regarding required practices; 2. Strengthening of the legal framework, especially as regards to regulatory activities. 3. Practical training in composting. <p>In addition to the above, the island needs government assistance to finance the following:</p> <ol style="list-style-type: none"> 1. Purchase of waste processing equipment such as balers/compactors and green waste shredders; <p>Budget to cover employment of staff to operate the new waste disposal centre.</p>	

1.2.1.5 Funadhoo, Shaviyani Atoll

	Waste Collection	Waste Disposal
Positive Factors with Existing SWM System	<p>The WDC is reported to be active in cleaning and sweeping of public open spaces.</p> <p>The new site will be a considerable distance from many houses. The Island Office has, therefore, applied for some Rf 100,000 for the purchase of a waste collection vehicle through the Public Sector Investment Programme (PSIP). To date they have not received a response.</p>	<p>It was reported by representatives from the Island Office that a site has been designated for the location of the new waste disposal site.</p>
Main Problems with Existing SWM System	<p>Presently, there is no formal waste collection service practiced within the island. Householders are required to transport their waste themselves.</p>	<p>There was a degree of uncertainty between the Island office and the Atoll Office as to whether the island actually had a designated disposal site or not.</p> <p>However, in the absence of a designated waste disposal site, there are no formal waste management services provided. Householders appear to be left to their own devices in this respect. Accordingly, extensive dumping and burning of waste was observed around the island, especially in and around the environmentally valuable area of the lagoon.</p> <p>No segregation of waste is practiced as everything is dumped in the bush, and is occasionally burnt. The Island Office does not provide any staff to oversee disposal activities.</p>
Comments on Proposed National SWM Policy	<p>If a new national waste management policy could help them tackle their existing waste problems then it would be welcomed.</p> <p>Once waste is segregated at the new disposal site, they are unaware of the treatment options there after.</p> <p>They are prepared to try waste recycling initiatives, with materials being bulk transported to Thilafushi, but are uncertain regarding the associated costs. They require government funding to help them purchase the necessary equipment.</p>	
Request for Future Assistance	<p>The participants at the consultation meeting identified the following as areas for assistance:</p> <ol style="list-style-type: none"> 1. Public awareness training regarding required practices; 2. Strengthening of the legal framework, especially as regards regulatory activities. 3. Practical training in composting. <p>In addition to the above, the island needs government assistance to finance the following:</p> <ol style="list-style-type: none"> 1. Purchase of waste processing equipment such as balers/compactors and green waste shredders; 2. Budget to cover employment of staff to operate the new waste disposal centre. 	

1.2.1.6 *Kulhudhufushi, Haa Dhaalu Atoll*

	Waste Collection	Waste Disposal
Positive Factors with Existing SWM System	<p>Waste collection services have been fully privatized under the Demo's waste management project.</p> <p>It is reported that some limited household composting is undertaken, but there are concerns that this practice could impact negatively upon groundwater.</p>	<p>The RDPMO (North) have provided the island with a modern, engineered waste disposal site, through Asian Development Bank's funding. The site and plant cost some US\$250,000.</p> <p>The site is provided with comprehensive plant and equipment comprising:</p> <ul style="list-style-type: none"> o Bulldozer; o Tractor; o Wood chipper; o Baler; o Hazardous waste storage area; o Perimeter fencing and o Site office <p>Operations at the disposal site are being undertaken by a private contractor.</p>
Main Problems with Existing SWM System	<p>Although collection services have been privatised, participants advised that the fee rates are too high for the majority of households. Consequently, due to complaints, other individuals have been allowed to offer collection services at a considerably cheaper rate. Consequently, the financial viability of the two 'official' contractors has been seriously undermined.</p>	<p>The new engineered site is a considerable distance from a number of houses. Those who cannot afford the services of the collection services continue to use unofficial disposal sites.</p> <p>Representatives from the Island Office advise that they are unable to determine who is responsible for dumping, so are unable to enforce correct practices.</p> <p>Further, they are of the opinion that there is no legal provision for them to fine offenders. Representatives of WDC feel that the Island Office is not taking the matter seriously.</p> <p>It is questionable whether an Environmental Impact Assessment was undertaken prior to the establishment of the new site. Consequently, a considerable quantity of mangrove forest has been lost.</p>
Comments on proposed National SWM Policy	<p>Initially, there was a considerable degree of confusion amongst participants about the purpose of the national policy.</p> <p>However, upon receiving clarification, the feeling was that they want the policy to be implemented as a matter of priority so that they can see the benefits of it.</p> <p>Again, concern was raised about the relevance of a policy written in Male' to their requirements on the island.</p> <p>Of primary concern, is the need for the policy to address the issue of providing affordable services to the residents;</p>	
Request for Future Assistance	<p>The participants identified the following areas as key for assistance:</p> <ul style="list-style-type: none"> o Assistance with undertaking a comprehensive public awareness raising programme; o Technical training in matters such as hazardous waste management; o Training in the issue of appropriate disposal techniques for the various waste streams, in particular difficult waste such waste from the local fishing industry. <p>In addition, to the above technical assistance, there was a request for the government to provide financial assistance to make existing services affordable to the public.</p>	

In addition to those islands which were visited, written waste management plans and documents for a number atolls and islands, which had been submitted to ES for comment, were also reviewed. These included:

- ◆ Ari Atoll;
- ◆ Vaavu Atoll;
- ◆ Eydhafushi, Baa Atoll; and
- ◆ Holhudhoo, Noonu Atoll;

Drawing upon the information and experiences gained through visiting the six inhabited islands, which is summarised in the above tables, and one resort island, coupled with the earlier literature review, it has been possible to identify the main barriers preventing the implementation of efficient waste management practices, and the most appropriate interventions for barrier removal.

2. Barriers to Improving Waste Management

As stated earlier, the Government is committed to development of a comprehensive NSWMP. However, for this to be achieved, there are a number of barriers which will need to be removed.

The following box identifies the primary barriers preventing sustainable improvements in the delivery of solid waste management services. Thereafter, each barrier is discussed in greater detail.

Box 1.3 Main Barriers to Improving Waste Management

1. Within the islands and atolls there is insufficient funding of waste management infrastructure, equipment and practices. It is noted that this is not the case within Male'.
2. The lack of investment outside of Male' is exacerbated by, or is possibly a function of, an absence of appropriate cost recovery mechanisms.
3. Inadequate institutional capacity within key government agencies, coupled with a lack of clear roles and responsibilities, has resulted in an absence of clear leadership or coordination on the subject.
4. Inadequate level of public education and awareness raising amongst the public resulting in uncertainties regarding available options.
5. Weak legislative and regulatory framework which hinders monitoring and regulatory functions.
6. Limited opportunities for the involvement of the private sector in service delivery.

2.1 Insufficient Funding

Waste management is, by nature, an expensive undertaking, and regularly accounts for the largest proportion of municipal budgets within developing countries, usually between 25 – 50%.

As is the case with most developing countries, it is apparent that GoM's limited financial resources are spread thinly amongst a number of competing services, of which waste management is but one. Further, it is apparent, particularly on the residential islands visited, that GoM have not, to date, prioritised the provision of waste management infrastructure and services.

Within Male' itself, the level of service of waste collection and disposal is comparatively high, although clearly additional investment is needed in the near future to replace aging waste collection vehicles, plus provide additional waste haulage vehicles. An alternative to increased funding on equipment within Male' would be to increase the participation of the private sector in the delivery of waste management services.

As stated earlier, it is apparent that government investment in waste management facilities, within the inhabited islands, is particularly inadequate. Indeed, the majority of the inhabited islands visited lacked basic waste management infrastructure, such as an engineered disposal site, in conjunction with waste processing equipment such as shredders for green waste and crushers for glass and metal items.

The island of H.Dh.Kulhudhufushi is the obvious major exception to this rule, as it has been provided with an engineered site and a comprehensive range of equipment through the RDPMO (North), via funding from the Asian Development Bank (ADB). However, there are serious questions about the long-term viability of the project once bank funding, which is presently covering operational costs, ceases at the end of February, 2004. The present operational costs, paid to the contractor, are reported to be some Rf 23,000/month.

The H.Dh.Kulhudhufushi Island Office, which will assume responsibility for the disposal facility after February 2004, are hopeful that costs can be covered through the renting out of the site's tractor and the de-silting tanker. However, after a preliminary inspection, the consultant remains doubtful about these revenue sources being sufficient. Rather, it is considered that the site may be far more economically viable if it were to operate on a regional basis, rather than simply serving the island of H.Dh.Kulhudhufushi. Thus, this option should be examined in greater detail.

On the other islands, it is clearly well beyond the resources of the residents to self-finance such facilities, which would cost several hundred thousand US dollars. Consequently, various alternative external funding sources have been sought.

For example, in the case of N.Velidhoo, the UNDP office was able to access Canadian government funding, through their Atolls Development Project, to supplement local funds, for the construction of a basic disposal site, and another site on the island of N.Manadhoo is under construction. It is understood that other islands have submitted, or are in the process of submitting, similar applications for funding.

However, although disposal sites such as the one in N.Velidhoo, and the one under construction in N.Manadhoo, are significant improvements from previous practices, in the absence of waste processing equipment, such as chippers for green waste, and crushers for bulky non-combustible waste, such as glass and metal, the new sites will have very limited application. In some respects, they may simply provide an improved location for the continued burning of waste, as was suggested to be the intention on the island of N.Holhudhoo. Thus, waste management infrastructure may have improved, but operational practices will not have.

In addition, where recyclable materials are being separated and stockpiled, as is the case in N.Velidhoo, in the absence of processing equipment, it will remain uneconomically viable to recycle the material due, primarily, to the considerable transportation costs to access the markets. Compaction and/or crushing of the materials significantly increase their density and makes transportation far more efficient and cost-effective.

Clearly, there are serious limits to the amount of external donor funding which can be accessed for the provision of waste disposal facilities. Consequently, GoM may need to consider providing funding for disposal sites and waste processing equipment as basic island infrastructure, in the same way it funds other essential facilities such as roads, schools, electricity and water supply.

Obviously, the very tangible problems associated with inadequate funding of waste management infrastructure do not apply to the resort islands. Resort developers and operators generally have considerable budgets at their disposal to adequately cater for these requirements. However, as has been mentioned earlier in this report, there are concerns about both the design and age of a number of waste incinerators presently in operation within the resorts. Therefore, it is likely that, in the near future, many of these items will need to be replaced with newer, more appropriately designed units, or alternatively replaced by improved waste management procedures such as the increased application of composting and waste recycling. Factors such as those mentioned above, will require greater attention in light of the government's stated intention to significantly expand the tourism sector within the Maldives.

2.2 Lack of Appropriate Cost Recovery Mechanisms

It appears that the concept of paying a modest fee to cover the cost of waste collection has been received with mixed feelings, and participation, by the residents of the various islands visited. The key factor is that of affordability as the resource base within the islands is very limited.

The collection fee rate appears to vary quite considerably from island to island, with the average cost being in the range of RF10-20/month. However, in H.Dh.Kulhudhufushi a bidding process has resulted in rates of which are in excess of what average householder can pay (Rf 60/month for twice weekly collection), thus the service is not widely used. Rather, unofficial contractors are offering services for less than half of this rate.

For the application of service fees to be more broadly applied, there is clearly a need for far more attention to be paid to the issue of public education and awareness raising. But, in addition, affordability and willingness to pay need to be accurately determined and assessed before the introduction of new service fees.

However, in addition to the application of household fees, there are a range of other cost recovery mechanisms, which have been successfully implemented within other developing countries, which the GoM may wish to review. These include:

- ◆ Importation duties and levies on materials which are difficult to dispose of, including:
 - Plastic packaging and bottles;
 - White goods (cookers, fridges etc...);
 - Motor vehicles;
 - Tyres;
 - Oils and lubricants; and
 - Vehicle batteries.
- ◆ A deposit/refund system for plastic bottles;
- ◆ A tourism levy on all visitors to the island to go directly to the waste management budget;
- ◆ Charging for the disposal of all commercial/industrial waste. Presently, for example, this waste stream is disposed of free of charge centrally at the Thilafushi site, and within the individual islands. Within the context of Male', C&D waste has been observed to be particularly problematic and costly to deal with.

2.3 Inadequate Institutional Capacity & Lack of Clear Leadership

Law No: 4/93 Environmental Protection and Preservation Act (EPPA) appears to have addressed this issue as it lays out the legal basis for environmental protection and preservation within the country, and gave wide and mandatory power to the Ministry of Home Affairs and Environment (MHAE). Specifically, designation of land for the purpose of disposal sites in the islands is the responsibility of Environment Section.

Consequently, other government ministries and entities look towards the Environment Section of MHAE to provide guidance and leadership regarding all matters relating to waste management. However, in practice the Environment Section presently lacks both human and financial resources to adequately fulfill this role.

Within the Environment Section there is a general lack of technical waste management expertise and experience. This situation is entirely understandable given the fact that this is a relatively new discipline and one that has only recently been identified as a national priority. This situation, coupled with a general lack of human and financial resources within the Environment Section has meant that they have been unable to develop appropriate national waste management policies or strategies. Rather, they have engaged upon ad-hoc interventions, such as providing advice on disposal site location, on an as- and-when-necessary basis.

Therefore, in the absence of national coordination, or policy, various well intended waste management initiatives have been undertaken by numerous entities which have, to a certain extent, lacked the desired level of coordinated communication and cooperation. This situation has unfortunately resulted lessons not being shared, confusion as to which entity should be providing technical waste management advice to the islands, and the sub-optimum allocation of aid funding. For example:

- ◆ UNDP have, through their Atolls Development Project, provided considerable assistance to islands and atolls, including:
 - N.Velidhoo – contribution of New Zealand Mission funds to the construction of the waste management site;
 - N.Manadhoo – contribution of the Government of Finland funds towards the construction of a waste disposal site;
 - N.Holhudhoo – contribution of Canadian Mission Funds towards the construction of a waste management site;

- o Vaavu Atoll – contribution of Canadian Mission funds towards a safe garbage disposal project.
- ◆ The RDPMO have, through funding from the ADB, established waste management pilot projects within the islands of H.Dh.Kulhudhufushi and S.Hithadhoo. These initiatives comprise the construction of engineered disposal sites and the provision of site equipment, plus funding for their operation for a seven month pilot period;
- ◆ Funding is being sought through the PSIP administered through Ministry of Planning and National Development (MPND) by some islands, such as Sh.Funadhoo which is seeking to purchase a waste collection vehicle;
- ◆ The Ministry of Communications, Science and Technology (MCST) is presently engaged in a pilot project at the Thilafushi disposal site to determine the feasibility of extracting and utilizing methane gas from household waste for power generation;
- ◆ The Environment Section of MHAE is presently seeking some US\$2.5 million funding through the China Soft Loan Scheme for the purchase of equipment to improve the standards of waste collection within Male’;
- ◆ The MoFAMR are presently considering an application from B.Eydhafushi, to utilise UNESCO funding to assist with the development of a waste disposal site;
- ◆ The MCPW received technical assistance from the JICA in 1999 through a comprehensive study on solid waste management in Male’.

One clear exception to this situation of agencies looking to ES for leadership relates to the resort islands, the administration of which falls directly under the MoT.

Operators of these tourist resorts are required, under their licence, to provide plant and equipment for managing their waste, such as incinerators. Accordingly, officers from MoT undertake routine inspections of the resorts to ensure full compliance with licence conditions and specifications. At a meeting with senior representatives of MoT, it was reported that, on average, each resort would be visited at least on an annual basis.

Clearly, from an environmental perspective, it would be desirable for this frequency of inspection to be significantly increased to a recommended minimum of quarterly inspections. These inspections should be, as far as is possible, un-announced to ensure that routine operations and practices are reviewed. Otherwise, there is the significant, and understandable, risk of activities being ‘stage-managed’.

In addition, it is questionable whether existing staff within MoT are suitably qualified and trained in the relevant disciplines to adequately undertake waste inspections/audits. Matters to be reviewed

during the inspections should include quite complex issues such as the correct functioning of incinerators – including temperature and retention time, determination whether smoke or odour nuisances are being generated, and assessing broader environmental impacts from operations such as the marine dumping of organic waste.

Further, with the government’s stated intention to greatly increase the tourism sector by opening up many new resorts, this is going to place additional demands and responsibilities upon those staff within MoT who are responsible for checking compliance with licence conditions and specifications as they relate to waste management.

Table 1.7 and Table 1.8, on the following pages, provides a summary of the institutional roles presently undertaken by the key stakeholders within the waste management sector within Male’ and the inhabited islands.

Table 1.7 Male’ – Existing Institutional Roles and Responsibilities within the Waste Management Sector

		GOVERNMENT SECTOR						PRIVATE SECTOR
		MHAE	MPND	MoH	MCPW	MM	Police	Contractors
SERVICE PROVIDER	Waste Collection	NO	NO	NO	NO	YES	NO	YES (to a limited extent)
	Waste Disposal	NO	NO	NO	YES	NO	NO	NO
POLICY		YES (although not implemented)	NO	NO	NO	NO	NO	NO
REGULATION/ ENFORCEMENT		YES (although not implemented)	NO	NO	NO	YES (for waste collection compliance)	YES (although not a priority)	NO
PUBLIC AWARENESS		YES (although only partially implemented)	NO	NO	NO	YES	NO	NO

Table 1.8 The Islands – Existing Roles and Responsibilities within the Waste Management Sector

		GOVERNMENT SECTOR					PRIVATE SECTOR
		MHAE	MoT	Atoll Offices	Island Offices	WDC	Contractors
SERVICE PROVIDER	Waste Collection	NO	NO	NO	YES (service provided in some islands)	YES (waste collected from public areas and beaches)	YES (limited, but service provided in some islands)
	Waste Disposal	NO	NO	YES (involved in identification and allocation of sites)	YES (some islands provide site supervision)	YES (oversee site activities on some islands voluntary basis)	YES (only on H.Dh.Kulhudhufushi)
POLICY		YES (although not implemented)	YES (within resorts)	NO	NO	NO	NO
REGULATION/ ENFORCEMENT		YES (although not implemented)	YES (periodic visits to resorts)	NO	YES (undertaken at island level, but very insufficient)	NO	NO
PUBLIC AWARENESS		YES (although only partially implemented)	NO	YES (have conducted a number of workshops)	YES (where training has been provided)	YES (where training has been provided)	NO

As is illustrated by the above tables, the institutional roles and responsibilities are presently quite complicated, and at times ill defined. As discussed earlier, this situation has resulted in a degree of confusion and uncertainty amongst the key players as well as the general public.

To help to clarify matters, the following key areas of responsibility can be put forward for future discussion and consideration:

- ◆ Policy Development
- ◆ Client (collection and disposal).
- ◆ Operator (collection and disposal).
- ◆ Regulator

Each of these four distinct institutional roles has specific tasks and associated responsibilities which are highlighted below:

- ◆ Policy Development
 - o Developing & implementing solid waste management policy and performance targets.
 - o National investment planning, and budget preparation, for waste treatment and disposal facilities.

- o Waste data generation and utilisation.
 - o Designing and implementing a national solid waste public education and awareness raising programme and initiatives.
- ◆ Client
 - o Development of operational plans (either collection or disposal) to meet national policy and performance targets.
 - o Delivery of waste management services, either in-house or through contracting of the private sector.
 - o Tender document preparation, evaluation and contract award to enhance the participation of the private sector, where deemed appropriate and/or desirable.
 - o Monitoring of performance of in-house service or private contractor for compliance with service specifications.
 - o Revenue generation, through application of cost recovery mechanisms, such as household fees, and service contract payments, where applicable.
- ◆ Operator
 - o Provision of specified waste management service (either collection or disposal) in compliance with contract specifications and conditions.
 - o Services can be delivered by either in-house activities or private contractor.
- ◆ Regulator
 - o Monitoring performance of the operator(s) for compliance with national environmental standards as they pertain to water, soil and air quality.
 - o Initiating corrective measures such as legal action/fines against operators who fail to comply with relevant environmental standards.

2.4 Inadequate Level of Public Education and Awareness Raising

Again, the lack of national waste management coordination and policy has resulted in inadequate attention being paid to the matter of public education and awareness raising.

Through external funding, such as that provided by UNDP, some specific islands such as V.Felidhoo have been targeted for awareness raising activities, and these have yielded positive results, such as the phasing out of plastic shopping bags and their replacement with locally fabricated cloth bags which can be washed and repeatedly re-used.

In a number of the islands visited, there was a distinct lack of knowledge regarding waste disposal and waste recycling options available, and about what initiatives have been undertaken on other islands.

Therefore, it is broadly recognised that there is a pressing need for a comprehensive, sustained national waste management educational campaign to raise awareness about a number of key issues including:

- ◆ The consequences of poor waste management practices, including the negative impacts upon the following:
 - the environment (local, regional and global);
 - public health (links between breeding of disease vectors and ill health);
 - national economy (threat to tourism and fishing industries).
- ◆ Waste minimisation;
- ◆ Waste re-use and recycling;
- ◆ Composting at both the household and community level; and
- ◆ Waste disposal options for various difficult waste streams, including:
 - Hazardous healthcare waste;
 - Batteries;
 - Oil; and
 - Chemicals.

When planning a national waste management education and awareness raising campaign, the following should be remembered: “Education is a process, not an event”. In other words, the information and messages need to be continually drip-fed to the target audience over a prolonged period of time for positive results to be achieved and sustained.

2.5 Weak Legislative and Regulatory Framework

Monitoring and enforcement of waste management services has been observed to be generally weak. There are a number of government entities with partial responsibility for regulation and enforcement of waste management activities nationally:

- ◆ Within the inhabited islands, this function is the responsibility of staff of the Island Office. However, staff have received no formal training, and are unclear regarding their rights to impose fines on offenders. Hence, to adopt an approach of negotiation and conciliation rather than formally prosecuting offenders. One tangible consequence of this situation is the widespread informal dumping and burning of waste throughout many of the islands;
- ◆ The MoT is responsible for ensuring that tourist resorts comply with their licence conditions as they pertain to waste management activities. It is reported that resorts is inspected at least once per year for this purpose;
- ◆ Within Male', the Municipality employ officers to ensure that members of the public comply with regulations relating to placement of waste for collection. Again, an approach of talking to offenders is preferred to the use of fines;
- ◆ Nationally, the Environment Section of MHAЕ is identified as the organisation primarily responsible for the national regulation and enforcement relating to waste management activities under the 1993 EPPA. However, staff report that they have received no formal training in legal matters such as:
 - o Cautioning a suspect;
 - o Issuing summons;
 - o Presenting a case in court;
 - o Court procedures.

The lack of training, coupled with the lack of human and financial resources, discussed earlier in this report, probably accounts for the fact that few, if any, successful prosecutions have been initiated.

As discussed earlier within this report, officers from within the MoT are presently responsible for monitoring performance in respect of waste management within the resort islands. Due to the present infrequency of inspections, which is approximately yearly, coupled with uncertainties as to the extent of environmental expertise possessed by these officers, consideration should be given to increasing the role of Environment Section within the development of policy for the resort islands, along with the monitoring and enforcement role. These functions will become

increasingly important if the government proceeds with its stated plan to significantly expand the tourism sector. Such a development will exert additional pressures upon the local environment which must be carefully managed if growth is to be sustainable in nature.

2.6 Limited Involvement of the Private Sector in Service Delivery

Within both developed and developing countries, many advantages have been realised through the involvement of the private sector in the delivery of waste management services. Often, the private sector can increase efficiency, and reduce costs through the following:

- ◆ Application of commercial principles;
- ◆ Ability to mobilize capital and investment funds;
- ◆ Provision of management expertise; and
- ◆ Opportunity to draw upon regional and international experience to apply proven and cost effective technologies.

Nationally, there is limited involvement of the private sector in the delivery of waste management services. Where it does exist, there are a number of areas which require attention:

- ◆ Privatised services appear to be rarely awarded through the execution of truly open, transparent and competitive tender processes;
- ◆ Often, as is the case with Male's waste collection sector, private enterprises operate without the security of a contract. In the absence of such a formal agreement they are exposed to aggressive competition, and price undercutting which threaten their viability in the long term;
- ◆ Where services are provided by the private sector, monitoring and enforcement mechanisms are weak;
- ◆ Often, services have been privatised without any consultation with the public, and without sufficient attention to affordability and willingness-to-pay. An example of this is the island of H.Dh.Kulhudhufushi where privatised waste collection fees are too expensive for most householders, thus the service is not well patronised, and the contractors financial viability is presently reported to be in serious doubt.

3 Strategy

3.1 Alternative Scenario

The proposed alternative to the existing 'business-as-usual' scenario in the waste management sector is intended to assist with the country's sustainable development objectives and its goal of developing and implementing appropriate, affordable and sustainable waste management technologies and practices throughout the Maldives.

Central to achieving the above stated goal will be the development and implementation of a NSWMP, anchored within an institution which is mandated, and has sufficient resources, to be responsible for its implementation.

To ensure the success of the NSWMP, the project will comprise a range of interventions that will address all existing barriers, which include:

- ◆ Insufficient investment in waste management infrastructure, equipment and practices.
- ◆ An absence of appropriate cost recovery mechanisms to meet waste management operating costs.
- ◆ Inadequate institutional capacity within key government agencies, including those at the atoll and island level, coupled with a lack of clear roles and responsibilities, which has resulted in an absence of clear leadership or coordination on the subject.
- ◆ Inadequate level of public education and awareness raising resulting in uncertainties regarding available waste treatment and disposal options.
- ◆ Weak legislative and regulatory framework which hinders monitoring and regulatory functions.
- ◆ Limited opportunities for the involvement of the private sector in service delivery.

The proposed alternative scenario will initially bring about a modest improvement in waste management practices. Thereafter, over a five year period, as the national policy is developed and implemented, in conjunction with the removal of existing barriers, significant and sustainable improvements will be realised. Thus helping to ensure the continued development of the two industries upon which the economy of the Maldives is dependent - tourism and fisheries.

3.2 Outputs and Activities

The proposed UNDP funded project will be implemented over a five year period and will comprise a range of activities to develop and implement the NSWMP and remove all existing barriers.

The expected outcomes are detailed in the following sections. They are presented in chronological order rather than in any order of priority. It is recognised that many of the outputs and activities are inter-related, and follow a logical sequence in terms of their execution.

3.2.1 Output/Component 1: Institutional Strengthening

Clearly defined and separated institutional roles and responsibilities are identified, communicated and agreed upon by all major stakeholders. A strengthened Environment Section is established within MHAE to fully execute its role of national waste management policy development and implementation. ES staff, as well as staff from other relevant government agencies, is adequately trained, additional staff has been recruited, as appropriate, and the necessary degree of capacity building is undertaken.

The specific tasks are detailed below. Task No. 1 can be undertaken separately, whereas tasks No 2 – 5 are, to a large extent, interdependent upon each other:

1. Review present practices throughout the national waste management sector, drawing upon information already contained within earlier studies, and clearly define separated institutional roles and responsibilities. One area for particular attention is that of the resort islands to determine whether the existing arrangement, whereby the MoT is solely responsible for policy and regulation is sufficient, particularly in view of the proposed expansion of the sector. Through a series of workshops and consultations, obtain approval of all key stakeholders for the revised national structure.
2. Undertake a comprehensive training needs assessment for relevant staff within ES and other key stakeholder agencies which will include, but not necessarily be limited to, the following:
 - ◆ Ministry of Atolls Development, including Atoll Offices and Island Offices;
 - ◆ Ministry of Construction and Public Works;
 - ◆ Male' Municipality; and
 - ◆ Ministry of Tourism.

3. Based upon the findings of this assessment, design and implement a detailed training programme to satisfy the various stakeholders' roles and responsibilities. Topics to be included should include:
 - ◆ Developing and managing waste management data information systems.
 - ◆ Undertaking waste characterization exercises in compliance with international practices and guidelines.
 - ◆ Undertaking waste audits and inspections (particularly relevant to MoT).
 - ◆ Hazardous waste management.
 - ◆ Health and safety.
 - ◆ Procurement procedures, including:
 - Tender document preparation and evaluation;
 - Contract negotiation and contract award;
 - Contract supervision and monitoring.

4. Assist with the development of a recruitment plan for ES and provide support for all necessary recruitment, including:
 - ◆ Identifying recruitment needs for the organization;
 - ◆ Help with presenting the business case for recruitment within Environment Section to the GoM;
 - ◆ Prepare advertisements and terms of reference;
 - ◆ Support in the interview and selection process; and
 - ◆ Assist with the development of personnel contracts.

5. Develop an annual staff appraisal system, which includes:
 - ◆ Goal setting;
 - ◆ Review and evaluation procedures;
 - ◆ Indicators of success;
 - ◆ Career development.

3.2.2 Output/Component 2: Development of a National Solid Waste Management Policy (NSWMP)

A dedicated officer within Environment Section will be identified from existing staff, or recruited, as necessary, to take full-time responsibility for the development and implementation of the NSWMP. The NSWMP must be finalised, having taken into account the National Development

Plan, and its progressive implementation underway. The NSWMP shall be finalised through a process of national consultation and the establishment of focused working groups. Targets shall be achievable and realistic to ensure success. For example, reducing the amount of green waste burnt through the adoption of composting is relatively easy to achieve, whereas alternative management of other waste streams, such as plastics, will require further investigation and attitudinal change, and will take longer to achieve.

The specific tasks are:

1. The completion of comprehensive and representative waste characterisation exercises within Male' and representative of inhabited and resort islands. The task should be completed in compliance with international guidelines and recommendations, and will provide accurate and valuable information regarding the percentage compositions of all waste components.
2. Undertake fieldwork, in conjunction with reviewing existing reports and documentation, to assess existing waste management practices. Make firm recommendations regarding the design, equipment and operation of future waste management centres, and whether they should be established at an island or atoll level. In addition, review licence conditions, practices and equipment within selected resort islands and make firm recommendations regarding the scope and nature of all necessary improvements.
3. Determine the feasibility of extending waste recycling activities throughout the atolls, islands and resorts. Identify viable markets for the range of recyclables, logistical requirements such as pre-processing of materials, and develop appropriate contract documentation.
4. Assist with the establishment of new, or the evaluation of existing, pilot activities to determine the applicability of selected waste management technologies such as composting, bio-gas utilisation and waste recycling.
5. Undertake a programme of national consultation to ensure that the NSWMP is developed in a participatory manner to represent the consensus of all key stakeholders. Ensure that the NSWMP embraces core environmental principles, such as:
 - ◆ **Global Citizenship** – Responsibilities to protect the environment extends beyond the Maldives national boundaries. Some wastes will have to be exported for treatment elsewhere, possibly including batteries and some toxic chemicals. This principle recognises the responsibility to consider the global consequences of our wastes.
 - ◆ **Environmental Stewardship** – The obligation of current generations to maintain environmental quality for present and future generations. Further, it acknowledges the individual responsibility we have in managing our wastes to lessen their environmental impact.

- ◆ **Extended Producer Responsibility** - Producers have a degree of responsibility for their products throughout the product's lifecycle, from production to final disposal. Thus manufacturers and marketers are encouraged to find ways to reduce a product's environmental impact.
 - ◆ **Full Cost Pricing** – The environmental effects of production, distribution, consumption and disposal of goods and services should be consistently costed, and charged as closely as possible to the point at which they occur.
 - ◆ **Life-cycle Principle** – Products should be designed, produced and managed so that all environmental effects are accounted for and minimised.
 - ◆ **Precautionary Principle** – Where decision-makers have limited information or knowledge of the possible effects of an activity, and there are significant risks or uncertainties, a precautionary approach should be adopted.
6. Establish and co-ordinate the activities of inter-party working groups to develop proposals in relation to the key tasks which have been identified to support the NSWMP.
 7. Organise a series of strategic planning workshops, at appropriate times, and agree and finalise NSWMP priorities and components, as well as establishing clear institutional roles and responsibilities, plus achievable and affordable targets over five year periods.
 8. Provide training, skills transfer and ad-hoc advice to relevant staff within the Environment Section to ensure the efficient development and implementation of the NSWMP.
 9. Organise a series of strategic planning workshops, at appropriate times, and agree and finalise NSWMP components, as well as establishing achievable and affordable targets over five year periods, simple examples of which are provided below:
 - ◆ Up to end of 2005:
 - o Waste characterisation exercises to be completed, in compliance with international guidelines, within representative pilot atolls/islands.
 - o Waste management plans to be developed for each island, and to be incorporated within the Island Development Plan which is reported to being produced by the MAD.
 - o Ensuring that waste management practices are carried out in compliance with national guidelines and advice from the Environment Section.
 - o Collecting, treating and disposing of 75% of all solid waste generated.
 - o Reducing/prohibiting burning of waste.
 - o Establishing pilot projects for waste composting, bio-gas generation and waste recycling initiatives.

- ◆ 2005 – 2010
 - The establishment of waste user fees for household and industrial/commercial waste to be established and contributing towards operational costs.
 - The implementation of other cost recovery mechanisms such as Environmental Levies on difficult products.
 - Finalise completion of planning and construction of engineered waste disposal sites within Atolls/Islands, in compliance with the Environment Section's standards and specifications.
 - Implementation of bulk purchasing practices for appropriate products to reduce the amount of packaging waste.
 - At least 85% of all solid wastes to be collected, treated and disposed of.
 - The establishment of viable waste recycling practices and composting to be established to treat a desired percentage of recyclables, and divert them from landfilling or burning.
 - Collection and disposal of 100% hazardous healthcare waste by appropriate technology.

- ◆ Longer-term objectives, for after the year 2010 can be developed and reviewed over the next few years to better reflect the development situation and available technology.

Further, to get the NSWMP adopted in the widest possible manner, ensure that it is incorporated within the National Development Plan.

3.2.3 Output/Component 3: Public Education & Awareness Raising

A dedicated officer within Environment Section will be identified from existing staff, or recruited, to take full-time responsibility for the national waste management public education and awareness raising campaign. Adequate capacity building will be provide to the officer and assistance provided in the development of the national campaign and educational materials.

The specific tasks are:

1. Assist with the design and development of the national waste management educational campaign to raise awareness about all key issues including:

- ◆ The consequences of poor waste management practices, including the negative impacts upon the following:
 - The environment (local, regional and global);
 - Public health (links between breeding of disease vectors and ill health);
 - The national economy (threat to tourism and fishing industries).

 - ◆ Waste minimisation;
 - ◆ Waste re-use and recycling;
 - ◆ Composting at both the household and community level;
 - ◆ Waste disposal options for various difficult waste streams including, but not necessarily limited to, the following:
 - Hazardous healthcare waste;
 - Batteries;
 - Oil; and
 - Chemicals.
2. Ensure that the national waste management educational and awareness raising campaign makes good use of the numerous mediums available, including, but not necessarily limited to the following
- ◆ The development of a national, culturally appropriate, icon or mascot to act as a figure-head for all waste management educational and awareness raising initiatives;
 - ◆ The use of TV and radio to:
 - Run a series of commercials/jingles;
 - Produce educational programmes and documentaries; and
 - Host talk shows where the participation of the audience is encouraged and waste management and related environmental questions are raised and answered.

 - ◆ Enlisting the support of the commercial sector to sponsor certain activities such as:
 - The provision of T-shirts, gloves, equipment to assist with national clean-up activities;
 - The provision of waste management colouring/story books and plastic mugs with anti-littering messages for distribution amongst local schools;
 - Adoption of certain sections of roads and/or beaches for which they take responsibility for cleaning and maintaining; and
 - Provision of bins/containers within the communities.

- ◆ Working with educational authorities to ensure waste management issues are appropriately reflected within the national school curriculum;
 - ◆ Working with schools to enlist students in the participation of various waste management initiatives, including:
 - Design of national waste management icon/mascot;
 - Anti-littering poster competitions;
 - Cleanest playgrounds competitions;
 - Radio jingle competitions;
 - Recycling initiatives within the schools;
 - Participation within national clean-up activities.
 - ◆ Use of local celebrities, cultural figures to communicate messages in a stimulating and entertaining fashion, such as:
 - Participation of national musicians/celebrities in production of a campaign theme song or anthem;
 - Participation of national stars, celebrities, decision-makers to promote waste management message;
 - Participation of national artists to develop anti-littering posters for use on bill-boards and children's colouring books;
 - Use of street theatre, or equivalent, at schools, public gathering and waste management awareness raising events.
3. Assist with the production of a quarterly newsletter to be circulated to key stakeholders, NGOs, other government agencies, schools, libraries etc.

3.2.4 Output/Component 4: Improved Investment in Waste Management Infrastructure & Promotion of Cost Recovery Mechanisms

The specific tasks are:

1. Through a series of meetings and consultations with representatives of relevant government departments and agencies, develop a firm understanding of the present mechanisms for funding existing waste management infrastructure and operations.
2. Building upon the information gained through the completion of the above exercise, design and conduct a training course to raise awareness amongst senior decision-makers, such as within the Ministry of Finance and Treasury, regarding the pressing need to allocate greater

financial resources for the provision of waste management infrastructure, particularly within the atolls and islands. Attention should also be given to the potential consequences of failing to take corrective measures in a timely fashion, such as serious impediments to the continued development of both the tourism and fishing industries – upon which the economy of the Maldives is dependent.

3. Develop detailed cost recovery models to potentially fund improvements in waste management infrastructure and services. These should include, but not be limited to the following, which have been successfully implemented to meet waste management costs in other developing countries:
 - ◆ Increased government funding in conjunction with counterpart community contributions. Due to severe constraints at the local level, community contributions need not be financial in nature, rather the provision of labour and materials is often considered to be appropriate and sufficient;
 - ◆ Implementation of a fair and equitable household waste management fee to cover waste collection, treatment and disposal costs having first completed willingness to pay and affordability surveys within selected communities;
 - ◆ Introducing a disposal fee for all commercial/industrial waste which, with the exception of hotel waste, is presently disposed of free of charge;
 - ◆ Importation duties and levies on materials which are difficult to dispose of, including:
 - Plastic packaging and bottles;
 - White goods (cookers, fridges etc.);
 - Motor vehicles;
 - Vehicle batteries;
 - Tyres;
 - Oils and lubricants.
 - ◆ A deposit/refund system for plastic drink bottles, such as those that soft drinks are sold in.
4. Develop mechanisms, and seek appropriate approval for, ring-fencing funds raised through the implementation of any cost recovery initiatives to ensure they are allocated to waste management activities rather than simply allocated to the Government's Consolidated Fund where it may be allocated to other competing political priorities. One potential approach may be for the establishment of a Waste Management Account within ES, which would be subject to all of the usual government auditing procedures.

5. Working closely with the MAD, assist the Environment Section to prepare and defend, annual budget submissions for the provision of waste management infrastructure and services within the atolls and islands.

3.2.5 Output/Component 5: Encourage Private Sector Participation in Service Delivery

The opportunity for the participation of the private sector in the provision of waste management services through the establishment of open, transparent and accountable tender processes. Contract monitoring and enforcement mechanisms will be in place to ensure that the private sector delivers services in complete compliance with contract specifications.

The specific tasks are:

1. Having communicated the numerous potential advantages of the increased participation of the private sector within the provision of waste management services throughout the Maldives; determine the political acceptability of increasing the role and participation of the private sector.
2. On the basis that such initiatives are politically acceptable, engage representatives of existing and potential private waste management contractors to achieve the following:
 - ◆ Outline future areas of private sector participation in waste management services within Male' and the atolls and islands, which may include:
 - Waste collection;
 - Waste processing;
 - Waste disposal;
 - Transporting waste recyclables to national recycling centres; and
 - Purchasing of waste recyclables.
 - ◆ Determine the private sectors, willingness to participate in future waste management initiatives; and
 - ◆ Identify existing impediments and difficulties encountered by the private sector in providing efficient waste management services.
3. Assist with the production and implementation of, appropriate tools and documents to facilitate the participation of the private sector including, but not necessarily limited to, the following:

- ◆ Advertisements to be placed in national/regional press outlining required services;
- ◆ Pre-qualification documents;
- ◆ Tender documents;
- ◆ Tender evaluation matrix;
- ◆ Contract documents;
- ◆ Contract monitoring tools and proformas.

Prior to the privatisation of waste management services, undertake willingness to pay and affordability surveys within target communities.

4 Project Budget

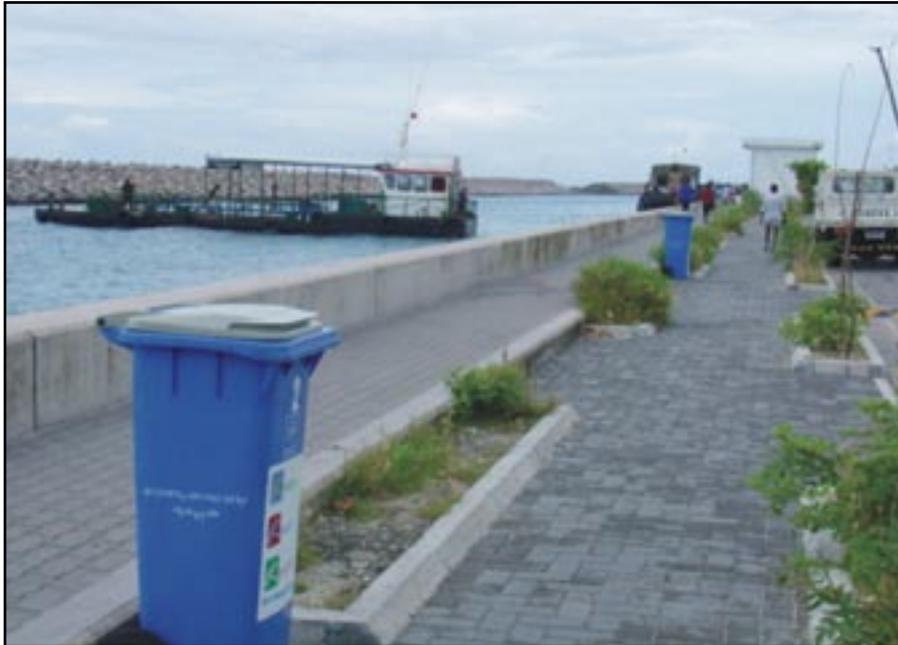
Component	Activity	Amount
Component 1: Institutional Strengthening		
1.1	Review present practices, clearly define institutional roles/reponsibilities.Obtain approval of revised national structure	22,175
1.2	Undertake Training Needs Assessment	13,204
1.3	Design & Implement Training Programme	19,754
1.4 & 1.5	Develop recruitment Plan for ES & Support Recruitment; Develop and initiate staff appraisal system	16,720
Total		71,853
Component 2: Development of National Solid Waste Management Policy (NWMP)		
2.1	Waste Characterisation Exercise	64,145
2.2	Assessment of Existing Waste Management Practices and Recommendation about Future SWM Centres	21,750
2.3	Assessment of Existing Pilot Project Activities	15,408
2.4	Review and expansion of Waste Recycling Activities	24,985
2.5	Organise Strategic Planning Workshops	33,320
2.6	Establish and Co-ordinate Inter-Party Working Groups	4,664
2.7	Provide Training and Skills Transfer	16,324
Total		180,596
Component 3: Public Education and Awareness Raising		
3.1	Design & development of SWM education campaign	4000
3.2	Multimedia campaign	30,000
3.3	Quarterly newsletter	12,600
Total		46,600
Component 4: Improved Investment in Waste Management Infrastructure and promotion of cost recovery Mechanism		
4.1	Develop a firm Understanding of Existing Waste Management Funding Mechanisms	10,278
4.2	Design and Implement an Awareness Raising Workshop for Senior Decision Makers Regarding the Need for greater Investment in Waste Management Infrastructure	5,498
4.3	Develop, and seek approval for Implementation of Appropriate Cost Recovery Mechanism	11,620
4.4	Develop, and Gain Approval for the Implementation of, Mechanisms to Ring-Fence Waste Management Funds, such as the establishment of a Special Waste Management Account with ES	12,072
4.5	Assist with Preparation, and Defining of the Annual Budget in Relation to waste Management Infrastructure and Services within Atolls and Islands.	12,298
Total		51,766
Component 5: Encourage Private Sector Participation in Service Delivery		
5.1	Promote Private, Sector Participation and Determine Political Acceptability for Increased Role	14,887
5.2	Engagement with Representatives of Private Sector to Determine Areas for Participation. Existing Barriers and Potential Intervention	17,687
5.3	Facilitate the Participation of the Private Sector in Service Delivery	12,677
5.4	Undertake Willingness to Pay and Affordability Surveys in Target Communities	20,517
Total		65,768
Grand Total		416,583

Output/ Component	Description	Estimated Cost US\$
1	Institutional Strengthening	71,853
2	Development of a National Solid Waste Management Policy (NSWMP)	180,596
3	Public Education and Awareness Raising	46,600
4	Improved investment in waste management infrastructure and promotion of cost recovery mechanisms	51,766
5	Encourage private sector participation in Service Delivery	65,768
	Total	416,583

ANNEX 1

PROJECT PHOTOGRAPHS

WASTE MANAGEMENT IN MALE'



Generally, it was observed that there was good variety, design and location of public waste containers throughout Male'. Further, a high level of attention was placed on sweeping of public highways and pavements. However, additional investment in increasing the number of waste containers, in heavily populated locations, would be recommended.



Some areas for public waste disposal exhibited signs of under capacity or infrequent servicing by collection vehicles.



The routine burning of waste at Thilafushi should be discouraged as it creates visual blight and a smoke nuisance to local residents and at times tourists. Adoption of composting would be a viable, environmentally friendly, option which would also provide cover material for the site.



Measures should be introduced to reduce the amount of waste presently entering the marine environment.



The amount of waste dumped into the marine environment around Male' is illustrated by the above photo which shows a sample of plastic waste materials removed from local coral reefs by MalDivers Centre, who along with their volunteers, undertake an annual clean-up.



The above photo, also supplied by MalDivers Centre, illustrates a sample of the glass waste dumped into the local coastal waters.

WASTE MANAGEMENT IN THE ISLANDS



This informal waste disposal site in Holhudhoo is representative of practices throughout the islands. The site is poorly located on the beach and all combustible wastes are burnt.



Efforts have been made to improve the present site in Felidhoo. It is provided with a wall, which helps to demarcate the site, but it does little to address the site's poor coastal location, or to prevent waste escaping into the marine environment.



The site in Velidhoo provides a positive model of appropriate site design. It is fully fenced and secure, however, it is questionable whether the concrete wall needed to be quite so substantial in height.



The design of the site allows for the segregation of non-combustible waste, such as metal and glass items. However, presently little thought has been given as to what to do with the stockpiled materials which are presently accumulating water and creating a breeding ground for mosquitoes.



The site at Kulhudhufushi, the site office to which is shown above, is an extremely good facility.



The site is provided with a broad range of fixed and mobile plant, such as the tracked dozer, as shown above. However, it is considered unlikely that the site can be economically viable unless it broadens its 'client' base, and improves the economy of scale, by functioning as a regional centre.



Within Funadhoo the absence of a formal disposal site, coupled with the relatively large nature of the island results in a high degree of informal dumping and burning of waste within the broader environment.



Valuable environmental resources, such as lagoons and mangroves, which tend to be perceived as 'wasted land' are targeted for informal disposal activities and are being damaged, possibly irreversibly.

RECOMMENDATIONS



The current practice of burning all combustible waste represents a significant waste of a resource, in that green wastes, which account for more than 50% of the total waste volume, can be composted to provide a valuable commodity.



Composting can be undertaken at a central waste treatment centre using equipment such as that shown in the above photograph. Chipping/macerating the material increases the surface area, and thus enhances the bacteriological breakdown of the material.



Production of compost can also be successfully undertaken at the household level, utilising small containers such as the one shown above.



The commercial production of oranges on an old dumpsite, utilising locally produced compost in eastern China is shown above.



Presently, opportunities to recycle materials, such as cardboard, are being wasted by the practice of burning all combustible wastes.



Through modest investment in recycling equipment, such as balers, the recycling of cardboard becomes economically viable.

ANNEX 2 PILOT PROJECTS

PILOT PROJECTS

1.1 General

Pilot projects are broadly recognised as an essential project tool that help to accurately determine the long-term viability of proposed waste management equipment, methodologies and procedures, before substantial, and often scarce, financial funds are committed to full-scale implementation.

Further, pilot projects assist in demonstrating to the public, and the various stakeholders, the policy's positive aspects and therefore help to generate public support for these proposed changes.

Therefore, in recognition of the above, a number of pilot projects are proposed by the Environment Section, MHAЕ, to assist them with the development and implementation of the proposed NSWMP.

1.2 Proposed Pilot Projects

Although development of the NSWMP is very much in its infancy, there have been a number of waste management initiatives undertaken in recent years on various islands such as N.Velidhoo and H.Dh.Kulhudhufushi.

Previous initiatives have varied considerably in their design and scope, but in the main they have focused upon the provision of waste management centres. However, the development within H.Dh.Kulhudhufushi, went further and made provision for waste management treatment facilities such as green waste shredders and balers for other various waste streams, such as metal and plastic containers.

The rationale behind the proposed pilot activities is to build upon, and to improve these existing waste management activities, rather than to establish new initiatives that would simply duplicate a lot of what has already been achieved.

Tasks specific to the individual pilot activities are outlined below.

1.2.1 H.Dh.Kulhudhufishi

Composting

- ◆ As a matter of priority, staff from the Environment Section, MHAE, should work with relevant representatives from MAD, MPND and the RDPMO (North) to get the green waste chipper repaired. It is reported that this item has never worked since the time of its original procurement. Further, there appears to be some considerable confusion as to which government agency should take responsibility to liaise with the supplier to undertake the necessary repairs. However, it should be noted that this apparent stalemate of local stakeholders might have costly ramifications, as the warranty for the equipment will shortly expire. Thereafter, considerable costs will be incurred, at the GoM's expense, to obtain specialist mechanical assistance to rectify the matter.

- ◆ Once the green waste chipper is repaired, the task of producing compost should be undertaken within the site. This will entail the following steps:
 - o Allocation of a dedicated area within the site for compost production;
 - o Establishment of 'windrows', of a maximum height of 2 meters;
 - o Achieving a good mix between green and brown organic waste to achieve a healthy balance of nutrients;
 - o Application of water, if necessary, to keep the pile of organic material moist, but not waterlogged. If necessary, plastic sheets can be placed over the material to reduced evaporation, particularly during prolonged dry spells;
 - o The regular, preferably daily, turning of the windrow with the site tractor, to ensure that the material has a good supply of oxygen;
 - o With the appropriate degree of supervision, compost could be produced within a period of eight to twelve weeks. Once produced, the compost could have a number of applications, including:
 - Cover material on the site to reduce problems such as flies, odour and windblown litter;
 - Soil enhancer and fertilizer on agricultural crops; and
 - Use for plant and vegetable production within domestic gardens.

- o Mature material from the septic tank pond could also be added to the windrows to enhance the composting process. Although this material should be inert after a period of weeks within the site, compost containing night-soil could be restricted for use within the site only.
- ◆ In support of the pilot composting activities, public awareness raising exercises should be undertaken to promote the benefits of producing and utilising compost.
- ◆ In parallel with the production of compost within the central waste processing facility, it is recommended that a small number, say ten, of household composting bins be purchased and distributed to selected dwellings. Allocation of units should prioritise those families/individuals already practicing domestic composting to some extent.

Recycling

- ◆ Determine the availability of regional recycling markets to receive a range of materials such as metal containers, aluminium drink cans, and plastic bottles. Attention should be paid to the market's requirements for pre-treatment such as shredding and baling of materials.
- ◆ Assess the economic viability of transporting materials to regional markets, taking due consideration of transportation and handling costs.
- ◆ If appropriate, give consideration to the provision of additional treatment equipment to the site, such as plastic shredders to increase the range of recyclable materials to be processed.
- ◆ If all pre-conditions look favourable, undertake pilot shipments of recyclable materials to pre-identified markets. Through completion of this activity, true operational costs, and any hidden extras, can be identified.

Regional Waste Processing Facility

- ◆ It is recognised that once funding from the Asian Development Bank (ADB) expires at the end of March'04, the site will struggle to operate in an economically viable fashion. Therefore, due consideration should be given to operating the site as a regional hub, serving other islands within the atoll.
- ◆ For this proposal to be evaluated, a number of criteria will need to be assessed, including:

- o Logistical requirements – such as feasibility of shipping waste between the islands;
- o Affordability – the cost of transporting waste products, where it is physically possible;
- o Desirability – do administrators on other islands wish to send their waste to H.Dh.Kulhudhufushi, and further, do the administrators within H.Dh. Kulhudhufushi wish to receive waste from other islands, albeit in receipt of a disposal fee.

1.2.2 N.Velidhoo

The recent construction and commissioning of the waste disposal centre within the island of Velidhoo is a major improvement over earlier practices. There are, however, a number of measures which could be undertaken which would represent the next significant step in terms of undertaking incremental, sustainable improvements. These are outlined in the following text.

Composting

- ◆ Presently, all green and organic waste is routinely burnt within the site. It is recognised that this practice causes a smoke nuisance to local residents, but in addition, it also represents a waste of resources, as the green/organic waste could be composted to produce a valuable product.
- ◆ The site should be provided with a green waste shredder, of a suitable specification to enable it to treat tree branches.
- ◆ An area should be allocated for the production of compost, possibly outside of the site boundary, if availability of space is an issue.
- ◆ The same procedures should be followed as were outlined for the facility at H.Dh. Kulhudhufushi. However, as mechanical plant is not available in N.Velidhoo, the aeration of compost, by its regular turning, can be undertaken manually by an individual using a pitch-fork, or similar.
- ◆ Application of the completed compost can be undertaken, as a pilot activity, within domestic gardens and within any larger scale commercial crop production areas.

- ◆ Again, as with H.Dh.Kulhudhufushi, it is recommended that a small number of domestic composting bins be distributed throughout the community, to explore the benefits of producing domestic compost as compared to that produced at the community level.

Recycling

Presently, the separation and storage of different, non-combustible waste streams is practiced within the facility. However, little thought has been given to the concept of processing or recycling these items. Therefore, the following activities are recommended:

- ◆ Determine the availability of regional recycling markets to receive a range of materials such as metal containers, aluminium drink cans, and plastic bottles. Attention should be paid to the market's requirements for pre-treatment such as shredding and baling of materials.
- ◆ Assess the economic viability of transporting materials to regional markets, taking due consideration of transportation and handling costs.
- ◆ If appropriate, as determined by completion of the above activities, provide waste treatment equipment to the site, such as shredder for plastic waste, a compactor for metal waste, and a baler for cardboard and paper waste to facilitate waste recycling activities.
- ◆ If all pre-conditions look favourable, undertake pilot shipments of recyclable materials to pre-identified markets. Through this activity true operational costs, and any hidden extras, can be identified.