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This regional evaluation of solid waste management in Barbados is a study carried out by the Pan American Health Organisation (PAHO)/World Health Organisation (WHO) and the Government of Barbados (GOB) through the Ministry of Health (MOH) to gain knowledge of the present solid waste management situation in Barbados. This was done with the assistance of a multidisciplinary National Coordinating Committee, which was appointed by the Cabinet of Barbados.

According to PAHO/WHO, regional collaboration has revealed a deficiency of information in this sector. The information available for use by agencies is limited and not systematically recorded and this has hindered the establishment of national policies for the improvement of the management of solid waste as well as preparation of guidelines for local and international technical and financial cooperation. This regional analysis of the solid waste situation led PAHO and the Inter American Development Bank (IDB) to develop a 'Municipal Solid Waste Management Situation Diagnosis' that identifies critical aspects and strengths of the sector. These were grouped as institutional and legal, technical and operational, economic, health, environment and social and community development. This study is therefore part of a region-wide effort by PAHO/WHO to assist countries to gather information that is necessary for decision-making and the implementation of solid waste management strategies in the countries.

The evaluation has multi-dimensional aspects and is intended not only to identify problems and deficiencies in waste management, but will be used for the arrangement, integration and development of solid waste programmes in the region. The general objective of the regional evaluation of solid waste management services 2002 is to gain knowledge on the current situation and future prospects for the development of solid waste management services. It is expected that this would be achieved through systematic information collection, processing and analysis, thus facilitating the establishment of policies, plans and programmes for improvement of the services. It is expected that the information gathered will lead to development of strategies for the arrangement and integration of solid waste sectors not only in Barbados, but also across the region. It is anticipated that the expected benefits from the Regional Evaluation of Solid Waste Management Services 2002 should lead to more timely identification of problems and deficiencies as well as the dissemination of successful, innovative solutions and appropriate technologies in participating countries.
For Small Island Developing States (SIDS) like Barbados, solid waste management (SWM) is a serious challenge with respect to environmental management and therefore SWM in Barbados seeks to address all aspects of solid waste including generation, setting out, storage, collection, transportation, processing, recovery and disposal of wastes. A multi-sectoral, multi-disciplinary approach has therefore been adopted to enhance the effectiveness of SWM on the island.

In Barbados, several Government Ministries, as well as private sector companies, jointly undertake solid waste management in the form of an Integrated Solid Waste Management Programme (ISWMP). At present, the Government of Barbados (GOB) through the Sanitation Service Authority (SSA) is responsible for the street sweeping, collection, transportation and disposal of all household municipal solid waste (MSW) as well as the operation of all five disposal sites on Barbados. In addition, the GOB through the Sewerage and Solid Waste Project Unit (SSWPU) is responsible for the construction of the physical elements that support the programme as well as the development of educational programmes, policy, legislation, institutional strengthening including training and technology development and other non-physical components of the ISWMP.

The GOB realises that for the proper functioning of the ISWMP there needs to be greater participation of the private sector. Under the programme, the private sector will not only be involved in the collection and transportation of institutional, commercial and industrial solid waste as well as recycling initiatives as they currently are, but will also be involved in disposal and other aspects of the programme.

The education programme that is being developed by the SSWPU is far reaching and caters to not only formal educational institutions but also provides for informal education to businesses, community groups and the general public. This is done through several media, including the use of brochures and the solid waste management website www.solid.gov.bb, as well as workshops and seminars.

Adjacent to the island’s domestic waste landfill at Mangrove Pond, St. Thomas, there will be a new Solid Waste Management Centre, which will consist of the National Composting Facility, a Transfer Station and a Chemical Waste Storage Facility. Phase III of the Mangrove Pond Landfill, which is currently being prepared, is expected to be in operation for approximately three years after which landfilling activities will be transferred to the Greenland Landfill in St. Andrew.

Given that in Barbados there is one major municipal waste collection agency and one central disposal site for municipal solid waste; and considering that there is no great distinction between urban and rural populations on the island, for the purpose of this study the entire island of Barbados is described as an urban population. The quality and coverage of collection of MSW in Barbados is quite good as all households and institutional, commercial and industrial agencies are serviced and street sweeping is carried out in commercial centres. Illegal dumping and littering has been significantly reduced not only due to this service, but also due to the solid waste educational and awareness efforts made by the SSWPU under the ISWMP.

The solid waste management sector is a vital sector in Barbados. For the year 2001 the total economic investment was estimated at Bds $59.1 million, with the public sector contributing approximately Bds $38.8 million and the private sector contributing approximately Bds $20.3 million. The solid waste management sector employs approximately 2000 persons, the majority (approximately 52%) of which work in the public sector. The sector is expanding gradually and is expected to continue to grow over the short to medium term.
For Small Island Developing States (SIDS) like Barbados, the disposal of waste is a serious constraint to sustainable development. The limited land area and resources for safe waste disposal coupled with the growing population, unsustainable consumption patterns and increasing imports of polluting and hazardous substances combine to make pollution prevention and the management of waste a critical issue. Also, since Barbados is very heavily dependant on the tourism industry for economic survival, it is imperative to preserve the country’s natural heritage and resources upon which the tourism industry is built.

Given this economic importance and the fragile nature of the small island ecosystem of Barbados, it is important to evaluate the local solid waste management sector to determine the quantity and nature of waste produced and to see whether present methods of dealing with the waste are adequate. Furthermore there is a need to integrate the three R’s into the waste management strategy in order to prevent damage and or destruction of the fragile ecosystems that support the economy. To complement these initiatives there is a need to develop and implement policy necessary to manage waste generated and in doing so minimize negative environmental impacts.

In order to address solid waste issues the Government of Barbados (GOB) is currently engaged in implementing a comprehensive Integrated Solid Waste Management Programme (ISWMP). The ISWMP is a Government approved programme for the management of solid waste in Barbados. It is an infrastructure project, critical to the social and economic development of the country. The Programme encompasses the whole island, and provides for the preparation of a long-term (20 year) vision for managing solid waste on the island.

The mission of the ISWMP is to develop a high quality, efficient and sustainable integrated waste management system, while fostering the participation of all residents in protecting the environment. There are three categories of objectives, the national objectives, the sectoral objectives and the programme objectives. The national objective is to reduce the potential for and incidence of disease and environmental degradation associated with poor waste management practices. The sectoral objective is to improve the level of sanitation through the provision of a dependable and efficient solid waste management system and the programme objectives are to provide modern infrastructure and equipment to support the solid waste management system, to provide a comprehensive public awareness and education programme thus empowering residents to participate in the management of our environment, to involve the private sector as partners in solid waste management on the island in a structured manner and to reduce the quantity and toxicity of solid waste on the island.

The ISWMP is divided into two main components. The physical component comprises an Engineered Sanitary Landfill, a Transfer Station, Composting Facility, Bulky Waste Facility, Chemical Waste Storage Facility and road upgrades. The non-physical component includes institutional strengthening of key government agencies, a public awareness and education programme, economic instruments, legislation and the development of policies to guide solid waste management over the long term.

Several government agencies share responsibilities for the execution of the solid waste management programme administered by the public sector. These agencies include:

- The Sewerage and Solid Waste Project Unit (SSWPU)- Ministry of Health
- The Sanitation Service Authority (SSA)- Ministry of Health
- Queen Elizabeth Hospital (QEHI)- Ministry of Health
- The Environmental Engineering Division (EED)- Ministry of Physical Development and Environment
The future plans for the ISWMP over the short-term is outlined in a 10-year strategic plan that was prepared by the Ministry of Health in 2002. The plan attempts to address all aspects of solid waste management, with a view to addressing existing deficiencies such as littering and illegal dumping as well as to facilitate the provision of the components that will enhance the island’s approach to solid waste management. The programme involves both the public and private sector where the public sector would deal with the provision of legal and economic instruments and policy making in addition to its involvement in waste collection while the private sector would continue to be involved in the collection and recycling of waste and in addition to this would become involved in the disposal of waste. Since long-term disposal options are limited, Barbados is looking for ways to minimize the waste generated and convert the waste that is generated into a resource. The plan will be revisited every three years for necessary updates.

Figure 1. Map of Barbados.

(Source: www.caribnet.net/barmap.html)

KEY:
1. Sewerage and Solid Waste Project Unit
2. Sanitation Service Authority
3. Bagatelle Bulky Waste Facility (Bulky waste)
4. Mangrove Pond landfill (Municipal Solid Waste)
5. Lonesome Hill (Special Waste- blood and grease)
6. Rock Hall (Hazardous Waste- asbestos and fibreglass)
3.1. Physical, socio-economic and health characteristics of the country

Barbados is a Small Island Developing State located 13°N and 59°W in the Eastern Caribbean. It has an area of 430 km² and a population of approximately 268,000 with a growth rate of 0.4% p.a. according to the 2000 census. The island’s geological subsurface is 86% limestone which is porous and underlain with streams and cavities. The other 14% is represented by the Scotland District, which is comprised of oceanic clays, sands, shales and muds and is highly erodial. The water source is primarily ground water. The island, which is surrounded by about 90 miles of beautiful and varied coastline, is predominantly low-lying, undulating terrain with the highest elevation reaching just over 340m.


Barbados is widely known for its stable economy and is well managed. Between 1985 and 1989 the economy experienced a growth rate of 3.2% while it grew at a rate of 2.9% between 1993 and 2001. Tourism accounts for 11.2% and Agriculture for 5.9% of the GDP. Other key sectors are Manufacturing (9%) and the International Business Sector (7%). The unemployment rate decreased from 24.3% in 1993 to 12.3% in 1998 and 10.6% for the first 6 months of 1999. The overall unemployment rate for 2001 is 9.9% with that for females being 11.9% while that of males is 8%.

The population of Barbados enjoys good health. The life expectancy for men and women is 72.9 years and 77.4 years respectively. Infant mortality for 2001 was 15.8 and 18.8 per thousand live births for children under five years. Comprehensive immunisation coverage is provided for infants less than 1 year of age for measles, mumps, rubella, DPT and polio. An immunisation programme was also launched in 2000 to eliminate rubella by immunizing adults between the ages of 21-35 years. Public health service is available to the entire population free of charge. All Barbadians have access to adequate sanitation facilities and improved water facilities.

In Barbados education is compulsory between the ages of 5 - 16 years and this accounts for the high rate of literacy (97%). The present education system is structured into pre-primary, primary, secondary, tertiary and vocational. There are 83 public primary schools, 23 public secondary schools and one public vocational institution on the island. One of the three campuses of the UWI is located in Barbados. All public education in Barbados is free.

3.2. Evolution of the solid waste project over the last ten years

Solid waste management in Barbados has historically been guided primarily by the Health Services Act (Cap. 44). Before 1995 there was no national solid waste management programme to uplift the awareness and enthusiasm of the public; also SWM practices took place in an unstructured manner. Post 1995, after a feasibility study, the Integrated Solid Waste Management Programme was devised and implemented. The result is the pursuit of development of a modern, dependable and efficient waste management system in Barbados. The Programme is divided into two components, the physical component which comprises the waste disposal facilities and road infrastructure and the non-physical component which focuses on institutional strengthening, public education, policy development, legislation and economic cost recovery measures.

1 This is the rate of literate people 15 years or older for the entire island
It is estimated that each Barbadian generates approximately 0.9kg of solid waste per day. This translates into about 450 tonnes per day for the entire population or 160,000 tonnes of solid waste per year. This waste is primarily comprised of organic waste (33%), yard waste (26%), paper (20%) and plastic (9%). Of the total amount of waste generated 62% is attributed to the commercial sector while the remaining 38% to the general public. In 2001 there were about 2000 persons employed in the industry. Of these approximately 1100 persons or 52% are in the public sector.

The SSA, the GOB waste collection agency, has a fleet of 64 collection vehicles which provides a house-to-house service to about 85% of Barbadian households. The remaining 15% of households, due to their inaccessibility, have their refuse collected at an intermediate drop off point within the community. The SSA’s commercial division collects approximately 5% of institutional, commercial and industrial waste on the island while the remainder is collected by private haulers. The SSA moves an average of 170 tonnes (40%) of waste per day while the private waste haulers move an average of 280 tonnes (60%) of waste per day. Though the private sector handles a greater amount of waste per day than the SSA, the coverage in terms of number of properties being serviced is much more for the SSA, as their scope is nationwide, while the private firms deal with institutional, commercial and industrial waste.

The Mangrove Pond landfill is the facility used for the disposal of municipal solid waste in Barbados. In 1986 it had an area of 5.5 ha and handled 190 tonnes of waste daily. By 1998 the landfill was receiving 200 tonnes daily. Mangrove, due to the increasing load, was expanded in 1992 and an additional 8.4 ha was acquired to deal with the now 200 - 270 tonnes of waste that were arriving there daily but this too proved to be inadequate as within three months the waste load had increased considerably. At present the Mangrove Pond Landfill is 20 ha in area (approximately four times larger that its original size). The new cell at the Mangrove Pond landfill will have an area of approximately 4.8 ha and a volume of approximately 725,000m³. It is expected to accommodate about 600 tonnes of solid waste per day. This new phase is expected to have an operational lifespan of approximately 3 years. A new sanitary engineered landfill at Greenland St. Andrew has been constructed for use when the space at Mangrove has been exhausted. This new facility occupies 13.3 ha of land and has an estimated lifespan of 20 years.

Solid Waste Management in Barbados focuses on ways to develop a high quality, efficient and sustainable integrated waste management system while fostering the participation of all residents in protecting the environment. Incineration is practiced on a small scale on the island by entities such as the Queen Elizabeth Hospital, the Ministry of Agriculture and the Airport and Seaport. Together, these bodies incinerate a total of approximately 16,400 tonnes of waste per year. Currently the inert material remaining after incineration is disposed of at the landfill and there is no use made of the energy generated as a result of the combustion of these waste materials.

Paper, plastic, glass, ferrous and non-ferrous metals, electronic circuit boards, automotive batteries and cooking oil are targeted for recycling by local companies. In this respect it is estimated that approximately 152,173 tonnes of waste is recycled each year. Shredded paper is used in animal pens and this paper is further used in the manufacture of organic fertilizer. Composting is not done on a large scale in Barbados but is done at the home level and is promoted by the ISWMP. Used cooking oil is an ingredient in the manufacture of a protein meal that is used to make animal feeds. Some of the plastics (PET), are used by a local company to make roofing shingles while the remainder of the recyclables are shipped overseas for recycling at other facilities.

The total public sector investment in solid waste management for the period 1997-2001 is US $48.86 million (Bds $99.7 million). This was allocated to the installation, expansion and improvement of the infrastructure, including the resources allocated to the training, environmental education, development of personnel and strengthening of solid waste management institutions. Investment is done at the governmental level through the central planning system as there is no local government in Barbados. Little information is available on private sector investment at this period although in 2001 it was estimated that the investment was approximately Bds $20.3 million.
4.1. Solid waste management services within the institutional framework of the country

Solid waste management is administered mainly by government and holds a prominent position in the Ministry of Health. The Sewerage & Solid Waste Project Unit (SSWPU) is a dedicated management unit that works along with several other agencies to oversee the development of policies and the legal and regulatory framework for this sector (page 28 Arrangement of the SWM sector). Because solid waste management is multi-disciplinary, an integrated approach involving all players and stakeholders in the overall ISWMP is being pursued. This minimises duplication while addressing issues of overlapping responsibilities of the various agencies.

The SSA is the major collection service provider on the island. It is government owned and operated and accounts for all of the collection of household solid waste, some collection of commercial solid waste and operation of the disposal facilities. The NCC also plays a part in waste management as they are responsible for the clean-up of beaches and parks while MPT assists in street cleaning.

Note that given that in Barbados there is one major municipal waste collection agency and one central disposal site for municipal solid waste; and considering that there is no great distinction between urban and rural populations on the island, for the purpose of this study the entire island of Barbados is described as an urban population.

4.2. Policies

For the proper functioning of the ISWMP several other government departments have been involved in carrying out different functions. The Ministry of Health has the primary responsibility for solid waste management including collection, transport, disposal, monitoring and enforcement. They do this through several of their departments, which include the Sewerage & Solid Waste Project Unit, Sanitation Services Authority and the Environmental Health Officers (formerly the Public Health Inspectorate). The Ministry of Physical Development and Environment through its Environmental Engineering Division is responsible for monitoring and enforcement of legislation. The solid waste policy is articulated in the proposed Waste Management Authority and is as follows:

Non-physical component

- Creation of a Waste Management Corporation and establishment of an Advisory Committee to plan and execute all of the aspects of waste management including promoting public education and awareness
- Privatisation of some aspects of waste management
- Creation an oversight body to ensure a more efficient implementation of the provisions of the programme
- Ensuring better monitoring and compliance with the requirements of the Waste Management Act
- Training of persons in the various agencies and provide them with the tools to regulate, monitor and ensure compliance with all aspects of the new solid waste management regime
- Ensuring that the requirements for issuing licences and permits are met and that there is compliance with all aspects of the legislation and regulations

In addition there would be a physical component, which would include

- A national sanitary landfill
- A solid waste management centre comprising of
- Transfer station
- Chemical waste storage facility
- Composting facility
- Bulky waste facility
- Upgrading of road infrastructure

4.3. Legal framework

There are several Acts that are in place for the management of solid waste in Barbados. These include the Sanitation Service Authority Act, the Barbados Waster Authority Act (Cap. 234), the Underground Water Control Act (Cap. 235), the National Conservation Commission Act (Cap. 393), the Environmental Levy Act, 1996 and the Returnable Containers Act, 1985. There are a number of other statutes that have been enacted to deal with several aspects of solid waste management and these are:

Health Services (Disposal of Offensive Matter) Regulations, 1969
Health Services (Nuisance) Regulations, 1969
Health Services (Hotel) Regulations, 1969
Health Services (Offensive Trades) Regulations, 1969
Health Services (Collection and Disposal of Refuse) Regulations, 1975
Market and Slaughterhouse Act (Cap. 265)
Sanitation Service Authority Act (Cap 382)
Sanitation Service Authority (Fees) (Amendments) Regulations, 1996
Beach Protection Act
Marine Pollution Control Act, 1999
Dogs (Licensing) Control Act (Cap. 177)
National Conservation Commission Act (Cap. 393)
Underground Water Control Act (Cap. 283)

The Health Services (Disposal of Offensive Matter) Regulations, 1969 controls littering and dumping. Regulation 3 provides that no person shall throw, deposit or place an offensive matter on (1) the premises of another; (2) any water course or beach; (3) any public street, road, lane, valley, passage or thoroughfare; (4) or any other premises where the offensive matter may create a nuisance or be detrimental to public health. Regulations 4 to 7 deal with the transportation of offensive matter. The regulations require safe containment and transport of such matter to safe disposal sites and prohibit any discharge to the sea of such matter.

The Sanitation Service Authority Act (Cap. 382) established the Sanitation Service Authority and under the Act the functions of the Authority include to (1) remove refuse from any premises; (2) Clean, cleanse and water streets; (3) provide and maintain in sanitary condition suitable places, buildings and appliances for the deposit, disposal or destruction of refuse. The SSA provides waste collection and disposal services for certain categories of residential, industrial, commercial and institutional solid waste. The Ministry of Health has established some special purpose disposal sites for wastes such as asbestos, derelict motor vehicles and hospital wastes.
It is realised that the existing legislation is inadequate for the needs of all current solid waste management issues. Consequently, new legislation is being developed to deal with the diverse types of waste that are being generated. The proposed new SWM legislation will highlight several areas where new laws and regulations are needed in order to strengthen the institutional framework for SWM as well as improve the overall ability of the proposed Waste Management Authority to efficiently undertake its responsibilities.

A comprehensive Waste Management Act is being prepared to govern the solid waste management function. The various sections of the Act will address the following areas.

- Establishment of a Waste Management Corporation with the accompanying Board, powers, duties, functions and reporting requirements
- The establishment of a Waste Management Advisory Body
- Regulations governing the storage, collection, transportation and disposal of waste
- Regulations governing the siting and operation of disposal and processing sites and facilities
- Regulations for the management of waste in territorial waters
- Licensing of waste transporters
- Permitting of disposal and processing facilities
- Ensure the implementation and operation of the manifest system regarding all types of solid wastes
- Prescribe fines and penalties for non-compliance
- Establish regulations under the legislation for the operations of the Solid Waste Management System

In addition, the Solid Waste Management Act will also recognise existing related legislation and where necessary, would make amendments for transitional legislation coming into force. The Act may also serve to ratify other related international conventions and treaties.

4.4. Regulatory framework

The solid waste management function would be governed by the proposed Solid Waste Management Act of Barbados. The Act will provide for:

- Management and regulation of the solid waste management function
- Establishment of a Waste Management Corporation
- Amendments and repeals of existing solid waste management legislation
- New legislation to effectively manage the function

Regulations would also be developed to address many of the operational issues to the proposed physical system. These include:

- Licensing of companies, contractors and operators for the collection, transport and disposal of collected waste at the various facilities
- The structuring of fees and rates and the development of cost recovery mechanisms
- Waste containment standards
- Waste collection and transportation
4.5. Operational modalities of solid waste management services

All coordination of the operational modalities of solid waste management services is carried out by central government as there is no local government system in Barbados.

- The Sewerage and Solid Waste Project Unit (SSWPU) of the Ministry of Health is responsible for establishing the framework for and the initial overall implementation of the ISWMP. The Sanitation Service Authority (SSA) of the same Ministry has responsibility for the collection and disposal of solid waste. The Public Health Inspectorate assists with monitoring for compliance with and enforcement of legislation and associated regulations.

- Under the Ministry of Physical Development and Environment, the Environmental Engineering Division (EED) has the responsibility for monitoring and enforcement issues that pertain to solid waste management. The Environmental Unit (EU) is responsible for environmental education with respect to solid waste management and the National Conservation Commission (NCC) is responsible for preservation and beautification of the island’s public parks and beaches.

- The Office of the Attorney General (AG’s Chambers) drafts and revises solid waste management legislation and provides advice to Government in respect of legal issues in solid waste management.

- The Ministry of Public Works and Transport (MPT) has responsibility for road construction and maintenance of roads that service the disposal facilities.

Other government entities involved in solid waste management include the Airport Authority and the Barbados Port Authority, which have responsibility of handling all solid waste generated at their respective facilities as well as waste coming into port; and the Queen Elizabeth Hospital, which is responsible for the treatment of medical waste.

4.6. Training and technology development

New skills are needed both in the private and public sectors to effectively implement an integrated solid waste management programme in Barbados. To facilitate this, a training programme is being put in place to meet the needs of personnel in key government and quasi-government agencies under the ISWMP. It will be specifically designed to raise awareness and provide participants with tools to regulate, monitor and ensure compliance with all aspects of the new solid waste management regime. Joint venture relationships between local and international firms are being encouraged aimed at the transfer of skills and technology to locals. The overall training programme under the ISWMP will also involve the private sector haulers, for example, in the managing of hazardous waste.

The physical component of the ISWMP includes the Sanitary Engineered Landfill at Greenland, the Transfer Station, the National Composting Facility and Chemical Waste Storage Facility to be located at Vaucluse, the Bulky Waste Disposal Facility at Bagatelle, and the upgrade of roads as well as the associated machinery for their function. In addition, as the need arises, there will be upgrades of equipment and technologies using the Best Available Technology Economically Available Approach. The review will include assessments of developing technologies and techniques for solid waste management.
4.7. Financing of the sector

Financing of the sector is mainly from the GOB’s consolidated fund. There is no charge for household collection services, however, a tariff is applied for commercial waste collection. The final disposal of goods is indirectly covered by the Environmental levy which is a tax placed on all goods entering Barbados to subsidise the cost of disposal. All funds collected from the Environmental Levy are deposited into the consolidated fund. For the year 2001, the revenue collected from the Environmental levy was Bds $11,658,712.56. Commercial waste management monies for 2001 totalled Bds $371,569.58 for the SSA and approximately Bds $13,100,740.00 for the private sector.

The Waste Management Legislation includes several components that influence economic activity. The Environmental Levy Act that includes in the cost of an item, a percentage fee for disposal; the Returnable Containers Act that implements a refundable deposit on reusable and recyclable containers; and other legislative components that allow for the imposition of fines and penalties to deter negative SWM practices and for the granting of concessions and licences to encourage positive SWM practices.

4.8. Modalities of solid waste services

Public sector agencies, private sector firms and individuals serve the solid waste industry in Barbados. The SSA is the major collection service on the island. The collection services of the SSA are directed by the Health Services Regulations (1975). The SSA has a fleet of 64 collection vehicles, which provide a collection and disposal service to all residents of the island. In addition to the SSA collection service, there is a private collection service for institutional, commercial and industrial operations. There are 6 large private waste collection firms and approximately 14 smaller firms along with several individuals. Together these account for about 48% of persons involved in the provision of this service employed within the sector. While the SSA is funded by the Government, persons working in the private sector have to finance their businesses themselves.

The SSA is the only agency that provides a house-to-house collection service. Outsourcing is not done, hence the SSA is responsible for all household MSW. There is a plan for increased private sector participation in the other aspects of waste management.

The MOH takes direct responsibility for the delivery of medical waste from the various Government operated hospitals, polyclinics and other medical institutions. Private hospitals and doctors’ practices are responsible for arranging delivery of their medical waste to the Queen Elizabeth Hospital treatment facility.

There are a number of waste types not normally collected by the SSA outside of its commercial arm and these are normally handled and transported by the private sector. These include bulky waste, demolition and construction waste, market and slaughterhouse waste and hazardous waste.

4.9. Municipal resources for the provision of services

All funds for the provision of public SWM services in Barbados is provided by central government as there is no local government in Barbados. Private agencies fund themselves. The public and private entities involved in SWM utilise a modern and broad range of technology including road sweepers and compaction vehicles. In Barbados, sweeping of streets is done both manually and mechanically. There are 51 workers employed to sweep the roads of Barbados and five mechanical street sweepers. Three Government agencies carry the responsibility for street sweeping, the SSA of the MOH, the NCC of the MPE, and the MPT. The SSA, although a statutory organisation, is fully subsidised by the government. It employs approximately 300 persons for collection and an additional 58 persons are attached to the disposal sites. The private sector employs approximately 1000 persons for the collection and transport of waste. The rate of collection of household MSW ranges from daily in commercial centres to at least once per week in areas on the periphery of these commercial centres. Garbage collected is transported to the Mangrove Pond disposal site. Overall there are five sites of final disposal in operation on the island. These are the sanitary landfill (Mangrove Pond), bulky waste disposal facility...
(Bagatelle) and special waste disposal sites (Rock Hall, Spencers and Lonesome Hill). The NCC is responsible for beach, park and public garden maintenance. They also help to clean streets and squares as well as aid in recycling and litter awareness initiatives. Incinerators are in operation at the Queen Elizabeth Hospital, the Bridgetown Terminal (Seaport) and the Grantley Adams International Airport.

4.10. National and local plans and strategies for the development of solid waste management services

With long-term disposal options being limited in Barbados, the main objective is reduction of the quantity and toxicity of waste produced on the island.

There is an effort to get the private sector more involved in the operations of the programme. The GOB is seeking to involve the private sector to a larger extent in the disposal of solid waste. At present, they are mainly involved in the collection and transport of waste as well as recycling but final disposal still remains the sole responsibility of the SSA. Recycling initiatives by private organisations is a good way to reduce the amount of waste generated and to convert this waste into resources. One recycling programme already in operation is the conversion of shredded waste paper into bedding for use in animal pens and the use of used animal bedding in the making of organic fertilizer. There is also a local company that utilises used PET plastic bottles to make roofing shingles.

A comprehensive education programme is being implemented to address education and awareness of solid waste management. There is a move to get children at the pre-primary level involved in solid waste management initiatives and this will be done by placing attractively made bins in several nursery schools around the island. The erection of anti-dumping and anti-litter signs will also be carried out while displays, exhibitions, workshops and seminars, the solid waste website (www.solid.gov.bb) and brochures will continue to be developed and utilised. A curriculum guide to integrate solid waste management into the curriculum of both primary and secondary schools is also being developed. To date there has been a decrease in the amount of illegal littering and dumping around the island and this is believed to be due to a heightened awareness of solid waste management issues brought about by the ISWMP through the education and awareness component. This however will not be quantified until the perception survey is carried out in 2003-2004. There has also been an increase in the amount of involvement of the private sector in SWM activities. At present there is also a tender document out for the design, building and operation of waste disposal facilities by the private sector.
5. DELIVERY OF MUNICIPAL SOLID WASTE MANAGEMENT SERVICES AT THE LOCAL LEVEL

5.1. Quality and coverage of collection, transportation and final disposal

Collection of MSW in Barbados is carried out by the SSA, which is responsible for servicing all households in Barbados (approximately 80,000 households) using a fleet of 64 trucks and a workforce of approximately 300 persons. In order to efficiently and effectively administer these services, the island is divided into four geographical areas: the Southern area, comprising the parishes of St. John, St. Philip, St. George and Christ Church; the St. Michael East area comprising a section of each of the parishes of St. Michael and Christ Church; the St. Michael West area comprising a section of the parish of St. Michael and the Northern area comprising the parishes of St. Lucy, St. Peter, St. James, St. Thomas, St. Andrew and St. Joseph. The frequency of service to households is determined by location and housing density. The SSA provides a daily service to 10% of Barbadian households. These are for residents located on main roads and in commercial centres. The majority of homes (57%) are serviced twice weekly, these are houses located in high-density areas. 6% of houses located in less dense areas receive service at least three times weekly and the remaining 27% of the households (households on the periphery of the commercial centres) receive service once a week. Together these households account for approximately 170 tonnes of waste per day, all of which is disposed of in the Mangrove Pond landfill.

At the landfill there are 5 vehicles dealing with compaction (two D8 compactors, one D8 cat tractor and two 953 traxcavators), 1 open truck for transport of daily cover material, 1 water truck and 1 Thomas Skid Steer.

The Mangrove Pond landfill is located in the parish of St. Thomas at the waste centroid of the island. The landfill is made up of 3 phases. The oldest, phase I, which was operational in the mid 1980s was not a sanitary engineered landfill and so did not have a liner nor did it have a leachate collection system. In addition, the daily cover was inadequate. The phase I landfill is no longer in operation and has not been for the last decade. Phase II of Mangrove became operational in September of 1992 and is a scientifically engineered landfill with a clay liner. By December 2002, it was realised that the existing phase II was inadequate for the amount of waste that was received on a daily basis and so it became necessary to prepare 2.3 ha to the east and west of the existing site to accommodate the increase in quantity of waste. Between 1996 - 1997, there were several fires at Mangrove, which extensively damaged the leachate collection system and rendered it inactive. The fires were caused by improper management of the waste disposed of at the site. Around this time there was a 10 m pile of waste, which had ignited due to poor compaction and this pile had to be reduced. As the pile was levelled, garbage was placed on areas beyond the boundaries of the existing sanitary engineered phase II. This meant that some areas of phase II were not lined nor did they have a leachate collection system. At the turn of the millennium it was again realised that the space available at Mangrove was inadequate. To compensate for this there will be another emergency excavation of an area adjacent to phase II. This new addition, however, will have a clay liner. It is anticipated that even with the new emergency excavation made for phase II that the space will not be enough to sustain the amount of waste received and in the near future more space will be required. There are therefore plans in place for the development of phase III to accommodate this waste. Phase III of the Mangrove pond landfill will be 4.8 ha of land to the southwest of phase II designed to receive up to 600 tonnes of waste per day and will be scientifically engineered. It is anticipated that phase III will be in operation for approximately 3 years.

5.2. Cost analysis and rates for delivery of the service

There is no billing for household collection services, however, a tariff is applied for commercial waste collection. Final disposal of household and commercial waste is indirectly covered by the Environmental Levy, which is a tax that is imposed on goods at their point of entry into Barbados to defray the cost of the disposal of refuse generated by their use. This levy varies from as little as Bds $1 to Bds $150, depending on the product impor-
ted. The revenue generated as a result of the Environmental levy for the year 2000 was Bds $11,699,491.30 and that for the year 2001 was Bds $11,658,712.56. There is also provision for a tipping fee charged at the landfill of Bds $25 per tonne of waste or part thereof being disposed of there, however, tipping fees are not being charged at this time.

The SSA is funded entirely by Government subvention. The total expenditure of the SSA for the year 2000 - 2001 was Bds $22,660,590 which included personal emoluments and other charges. The SSA does not administer a fee for the collection of MSW. Fees are charged for the collection of commercial and industrial waste only and the total amount collected during the period 2000 - 2001 was Bds $372,046.98.

Waste collection and haulage carried out by the private sector accounts for an estimated Bds $13,100,740 per year. A 5m³ or 6m³ skip costs between $70 and $100 to deliver to the site and later haul to the landfill. The distance between the site and the landfill determines the difference in price. Daily rental of a skip is approximately Bds $5. The total value of this service per year is approximately Bds $4,739,280. The average cost of collection and transportation of special waste to the Lonesome Hill disposal site is approximately Bds $135 per 1000 gallons or 3.8 m³ of waste and this amounts to approximately Bds $855,360 per year in transport fees. The transport of asbestos and fibreglass is approximately Bds $500 per load (5m³ - 8m³) as these materials are potentially hazardous to human health and require special handling. The value of this activity is estimated at approximately Bds $180,000 per year.

5.3. Municipal development and its relation to solid waste management

In order to improve efficiency of the delivery of waste to the disposal facilities it is necessary to implement road improvements along routes where vehicles associated with the ISWMP will travel on a regular basis. The affected roads are Mile and a Quarter to Alleynedale, Benn Hill, Vaucluse to Highway 2A (Mangrove Road), Hoytes Village Main Road and Hoytes Village Tenantry Road. There is also the development of a Solid Waste Management Centre at Vaucluse St. Thomas, which would include a Transfer Station, a Chemical Waste Storage Facility and a Composting Facility. There is an administrative centre for the northern parishes located at Fort Denmark. However, this administrative centre will be relocated to the Vaucluse site.

5.4. Administrative management, economic and financing modalities of solid waste management services

Financing of the Government SWM programme is largely the responsibility of the MOH. Funds are provided from the Treasury Department to support the initiatives being undertaken. At present, however, the GOB has entered into an agreement with the IDB to finance part of the ISWMP. The financing is expected to be approximately US $13 million (Bds $26 million) to be utilized over a 3-year period and is to be applied to disposal facilities, environmental education and institutional strengthening. Although the loan agreement was signed in 1998, disbursements have not been issued to date. The Pan American Health Organisation by way of grants for smaller projects also offers some financial assistance.

As mentioned previously, some of the agencies responsible for SWM fall under other Ministries. For example, the EU and the EED of the MPE, and the operations unit of the MPT. As such, these Ministries are also required to make financial provisions for the related activities that fall under their remit and this too is provided by the Treasury Department.

Any private firms engaging in collection of waste and/or recycling finance and manage their enterprises themselves.

5.5. Small businesses involved in the collection, transportation and final disposal of waste and their contractual relation with the municipalities

The SSA and some private sector agencies provide solid waste collection and transportation services. The private sector companies collect institutional, commercial and industrial waste from local businesses. This is done
through private arrangement between the waste haulage company and the local business. There are no con-
cession contracts offered by Government and at present, there is no licencing or control of private companies
involved in this sector.

There are at least 6 main providers of skip services in Barbados where companies rent skips, which are collec-
ted either on a scheduled basis or on a request for service basis. In total there are over 30 skip vehicles and
approximately 780 skips. Small private haulers, where one-truck haulers contract with businesses to haul their
solid waste, are also in operation.

There is no private sector involvement in solid waste disposal in Barbados. As mentioned before, disposal of
waste is the sole responsibility of the SSA.

5.6. Micro-enterprises involved in sweeping and cleaning of ways, recycling and segregation

There are no micro-enterprises involved in sweeping or the cleaning of ways in Barbados. This is the responsi-
bility of the GOB and is undertaken primarily by the SSA of the MOH, NCC of the MPE and the services unit of
the MPT.

Recycling is done predominantly by the private sector, which receives sorted waste from several smaller firms
and individuals. This group of small firms includes automobile garages (collect used automobile batteries) and
bottle collecting firms. Recycling of shredded office paper and directories to make animal bedding and high-
grade compost is also done.

In addition, some government agencies also have recycling programmes. The SSWPU has an in-house separa-
tion system where their recycling bank collects newspaper, office paper, telephone directories, PET bottles and
glass bottles. A similar initiative is planned by the MPE. Furthermore, the local telephone company, Bartel, has
team ed up with the SSWPU, the SSA and a local compost producer, Grorganic, to recycle old telephone direc-
tories and convert them into a high-grade compost for the local market.

5.7. Sectoral projects carried out in Barbados

The SSWPU in collaboration with MPE, is developing a programme to facilitate the adoption of a system that
incorporates environmental considerations into all aspects of government operations, policies, programmes
and projects to enhance efficiency, health and safety and the quality of the environment through changing of
attitudes and practices in an initiative known as Greening Government. Towards this end, the SSWPU has
embarked on training a cadre of government professionals in the discipline of environmental auditing. This
training is intended to introduce the participants to techniques to identify waste streams in institutions and
organisations and provide options that could be used to minimise the waste streams in such organisations. The
training involves practical exercises and the skills acquired are being used to improve environmental manage-
ment in government offices.

The SSWPU is also working on the development and implementation of a SWM education programme in
Barbados. This is in the form of lectures, seminars and pilot projects as well as community outreach pro-
grammes. Information is also dispersed in brochures and on the SSWPU website www.solid.gov.bb. The Unit,
with assistance from PAHO and in collaboration with the Ministry of Education, will produce a teacher’s guide
called the “Guide to the Integration of Solid Waste Management into the School Curriculum”. The Guide, which
will be provided in electronic and printed format, provides lesson plans and teaching ideas on aspects of SWM
for teachers across the curriculum and is intended to be used in primary and secondary schools island-wide.
This is being implemented in parallel with informal education initiatives at the schools where students are
encouraged to form solid waste management teams to manage their school environment. In so doing, they
are encouraged to utilise waste receptacles that are provided and to reduce litter on the premises as well as to
adopt waste reduction programmes at the school.
In the public domain, the Project Unit spearheaded a public awareness campaign to encourage persons to bring their own bag when they go shopping to reduce the need for plastic shopping bags. Anti-litter, anti-dumping signage is erected to encourage persons to act responsibly by not littering. These signs are highly visible even at night and are erected along major roadways, parks, beaches, schools and communities and in other areas where illegal dumping and littering are known to have occurred. There is also a proposal for public benches and waste receptacles that carry a positive solid waste management message to be placed at strategic points around the island. Clean-up campaigns are also carried out at gullies and beaches under the "Gully Ecosystems Management Programme" organised by the MPE, and the "Adopt-a-Beach" programme which has a multi-agency committee comprising representation from the Ministry of Tourism and International Transport (MTI), MPE, MOH and the Barbados National Trust.

Workshops on waste minimisation and greening of workspaces at both private businesses and government offices, as well as a programme established to focus hotels on more environmentally viable practices are also being conducted.

In addition to the new landfill facilities at Greenland in St. Andrew, there are plans to construct a Solid Waste Management Centre at Mangrove in the Vaucluse area. This will consist of a Composting Facility, a Transfer Station and a Chemical Waste Storage Facility. Access roads are also being improved to facilitate the transport of waste to Solid Waste Management facilities and the Bulky Waste Disposal Site.

The SSWPU is currently working with the Attorney General’s Chambers to prepare comprehensive SWM legislation that embraces the cradle-to-grave approach to waste management. This includes a waste manifest to ensure that responsibility is taken for a product up to its reuse, recycling and or final disposal. Composting is one of the elements of the ISWMP that was formulated for Barbados through the feasibility study on solid waste management. Under the programme every household in Barbados will be encouraged to compost their kitchen scraps and yard waste. The compost is a useful and valuable product, which is a good source of organic soil conditioner as it improves both aeration and nutrient content of the soil.
6.1. Conclusions of the analysis indicating the strengths and weaknesses of solid waste management

Most of the weaknesses of solid waste management in Barbados are currently being addressed. It is expected that with the new legislation and policies being put into action, the overall programme will be more efficient and effective.

6.1.1. Strengths

- The level of dedication that the Barbados Government has for the programme indicated by the level of investment
- More collaboration and cooperation between government institutions
- Resources oriented to training several officers from different departments undergoing training
- Formal training programme to be developed in 2004
- Specific programmes geared to educating schools and communities and providing necessary tools for effective participation in the programme
- The effort to involve the private sector in more aspects of the ISWMP
- There is an integrated multi-disciplinary, multi-agency approach to SWM to involve all players that have an interest in the overall ISWMP. Thus different responsibilities can be delegated to different agencies and entities and matters can be dealt with more efficiently and effectively
- Enhanced regulatory procedures to solid waste management to ensure that the requirements for issuing licences and permits are met and that there is compliance with all aspects of legislation and regulation

6.1.2. Weaknesses

- Only a small percentage of recycling of “waste” materials (about 10%) is done
- No coordination of private sector agencies involved in private sector operations
- Limited sharing of information resources between the public and private sector agencies
- Tipping fees are not currently being collected although there is legal provision made for this
- Low priority is placed on environmental litigation by law enforcement personnel
7.1. Impact of solid waste management services on health and the environment

In general, the impact of SWM systems in Barbados on health and the environment is minimal. For Small Island Developing States (SIDS), like Barbados, lack of resources is always a problem and land availability is no exception. The primary means of disposal of solid waste in Barbados is sanitary landfilling and it is necessary to maximise the space available for this purpose. Barbados has one MSW landfill currently in operation, however, there is another MSW landfill that has been prepared for operation when the present one at Mangrove is finished.

The ground water catchments around the vicinity of the Mangrove Pond landfill are tested regularly and there is no evidence of groundwater contamination. Monitoring of the groundwater in that area is carried out by the EED. Because of the proximity to the coast and surface streams, the quality of the water bodies adjacent to the Greenland Landfill will be monitored by a committee comprising a technical working committee of members from the EED, CZMU, ISWMP and health officials.

At present there is no noise pollution experienced by the residents of areas closest to the existing operating landfill. This is because they are not close enough to hear the vehicles and machinery in operation (the closest residents are within a 1–2 mile radius from the landfill). Although in the past (1996 - 1997) these residents were exposed to unpleasant odours emanating from the landfill, this is currently not the case as management of the landfill has improved significantly.

7.2. Epidemiological studies conducted to measure the impact of inadequate waste management on health

No records have been found to date to indicate epidemiological studies associated with SWM. There are no diseases present in the society that are associated with or directly related to poor waste disposal practices in Barbados.

7.3. Occupational health of formal and informal workers involved in collection and transportation of waste

There is no dedicated database of the occupational health of workers associated with the SSA. However, individual records on each staff member would include reference to any occupational health and safety issues. The SSA holds these records confidentially. The private sector, as mentioned before, is made up of small businesses and individuals and does not have a governing body and thus information and data related to their occupational health would not be available in one discrete location.

7.4. Equity, efficiency, quality, effectiveness and sustainability of the services on the basis of the economic and social development of Barbados

Barbados is a small island of 430km² and a population of approximately 268,000 persons. For the purpose of solid waste management the entire population of Barbados is an urban population and since there is no local government all solid waste activities are managed by central government. Household MSW is collected at least once a week in Barbados by the SSA. The frequency of collection of household refuse is dependant on location of the home and housing density. Houses on main roads and in commercial centres are serviced daily while houses on the periphery of these commercial centres are serviced once a week. The frequency of collection is not dependant on the wealth or affluence of the household as poorer persons living in commercial centres and main roads receive the same once a day service as the wealthier households in similar locations. Similarly, those persons living on the periphery of these commercial areas, both rich and poor, receive the same once per week
service. From this it can be seen that a poor person living on a main road will receive more SSA visits than a rich person living in a more rural area.

The service provided by the SSA is efficient as there is no recognisable pile up of waste seen on the streets due to inadequate refuse collection. In addition to collection of refuse on a daily basis, especially in the Bridgetown area, the roads are also swept. Any waste seen on the roads at night or early in the morning is as a result of indiscriminate littering or dumping by members of the community and not as a result of lack of efficiency or quality of service provided by the SSA.

There is no outsourcing done by the SSA with respect to the collection and transportation of waste and, as mentioned before, the only agency responsible for the collection of MSW in Barbados is the SSA. There is thus no competition between the SSA and the private sector for the business of household collection or transportation. The private sector is involved in the collection and transportation of institutional, commercial and industrial waste and does much more of this than the SSA. This is a competitive industry and so the percentage market share is based on market forces.

7.5. Economic value of the sector in terms of generation of work, exchange of goods and services, development of small businesses and recycling

The solid waste management sector is an important sector in Barbados. The private sector invested an estimated BDS $20.3 million originating from a broad range of activities that are conducted by firms in the sector while the public sector invested approximately BDS $38.8 million in 2001. However, the economic value of the sector in terms of generation of work, exchange of goods and services, development of small businesses and recycling has not been analysed; this is to be done in 2003.

There are many small business firms and individuals involved in waste collection, transportation and recycling. Recycling of organic waste, paper and plastics is done and a few businesses were born out of this. The economic value, however, cannot be assessed although it is recognised that employment is generated as a result of these efforts.
8.1. Community participation: mobilisation and community organisation

Efforts are being made by the ISWMP to have communities involved in home composting as seen by their production of a brochure specifically dedicated to this education and training. This effort was aided by the Rotary Club of Barbados, which made compost bins available for home composting.

There are a number of community-based organisations and neighbourhood watch committees that periodically pursue environmental activities like cleanups and recycling. The Braggs Hill community in St. Joseph was involved in the cleaning and removal of garbage from its gully with the assistance of members of the Ministry of Physical Development and Environment, the Barbados Defence Force, Environmental Health Officers, The Sanitation Service Authority and The Sewerage and Solid Waste Management Programme. Another community group involved in environmental issues is the Six Mens Community group, who is working with PAHO/WHO to pursue an in-depth educational programme with technical assistance from the SSA, SSWPU and the CZMU.

There are a number of community-based organisations that have been involved in composting and recycling activities as part of their organic farming and community fundraising ventures. There is also an annual Independence mini-parks competition where community organisations are also involved in composting and recycling initiatives to raise funds for community type activities. Bawdens and Cornerstone are two groups that have worked with both national and international organisations in the development and implementation of composting, organic farming and similar sustainability-based projects.

8.2. Participation of NGOs and other groups of civil society in SWM

There are several NGOs on the island of Barbados. The Caribbean Conservation Association (CCA) is a regional NGO, which interacts with other local NGOs and is involved with the development and implementation of regional environmental projects. They publish a newsletter, which provides information on local environmental issues. In 2001, the Barbados Association of NGOs (BANGO), has been involved in the coordination of local NGO activities. Some local NGOs are involved mainly in the educating of persons on environmental matters. Counter Part Caribbean, at the Future Centre Trust, is in the process of the development of a permanent educational site where there will be posters and other displays for viewing. They also place articles in the local newspapers on environmental issues and organise educational tours for children. Treading Lightly, another local NGO, brings together interested persons for discussions on environmental issues and also plays a key role in the Greening Barbados initiative. The Scotland District Association does not really involve itself in educational issues but is involved in the advocacy against the siting of the Greenland landfill in that area out of concerns for its residents. The Barbados Environmental Association, the pre-eminent environmental group in Barbados, is involved in a number of initiatives. These include the cleanup of the Jack in the Box Gully, which was a major illegal dumping site, and the introduction of a comprehensive beach cleanup campaign. They were also involved in the development of an educational brochure and several other educational materials. The Barbados Environmental Association was also responsible for the formation of another NGO, the Barbados Environmental Youth Programme (BEYP). The BEYP is involved in stimulating interest in young people on environmental matters, including the education and implementation of positive actions under the banner of "We Can Change The Future". They are very active in a number of secondary schools around the island. Other groups like the Girl Guides, Boy Scouts and Cadets are also periodically involved in ad hoc SWM activities.

8.3. Municipal support for community programmes

Government lends monetary and technical assistance to a number of community groups and programmes involved in environmental issues. Technical assistance comes in the form of lectures and workshops to provide
the necessary technical knowledge that is required. Advice on programme development is also given. The SSWPU has helped in proposal development as well as offered equipment to groups in order for them to carry out their programmes. Members of the SSWPU have acted as resource persons, given lectures and hosted workshops and seminars. In addition, monetary contributions are also made to assist NGOs and CBOs in funding their activities. Some private sector entities also contribute both monetarily and “in kind” to solid waste management efforts.

8.4. Education and sanitary environmental communication

A curriculum guide to the integration of Solid Waste Management is being developed by the SSWPU and PAHO for use in the island’s primary and secondary schools. These guides will be distributed to all primary and secondary schools in Barbados in print and electronic format. In addition, as part of the public education in SWM, the unit has targeted a number of schools around the island for lectures, seminars and pilot projects. The SSWPU is also working with a secondary school on the development of a pilot project on SWM in schools. Formulation of the project involves working with students, teachers and other staff including grounds-keeping, maintenance and canteen personnel. Upon conclusion, this programme will serve as a blueprint for implementation of several projects in schools around the island. Education and awareness of the general public is also in the form of television programmes, newspaper articles as well as dispersal of information on the solid waste website www.solid.gov.bb, and the SSWPU brochure series with 4 brochures dedicated to different aspects of SWM. The “bring your own bag” campaign is another programme being carried out by the SSWPU in an effort to encourage Barbadians to reduce the use of plastic bags and to promote the use of a reusable bag. There has also been communication to the general public as to the importance of maintaining a sanitary environment as it relates to the prevention of the spread of diseases such as dengue fever. The MOH continues to pursue a campaign for the prevention of the spread of this potentially deadly disease and involves the local health care polyclinics in the programme, which includes television and radio awareness advertisements, brochures, household visits, lectures and workshops and biological and chemical pest control to ensure that residents were complying with the guidelines for the prevention of harbouring the Aedes aegypti mosquito, which is the vector for dengue fever.

8.5. Hygiene and occupational safety programmes for staff members of the sector

There is a medical programme designed by the Chief Medical Officer for the SSA collection staff where they are required to have a complete medical check-up on entry into the system. After this, the collection staff is required to undergo a complete medical examination annually including eye checks and testing for diseases such as hepatitis.

SSA collection personnel undergo two weeks of intensive training before their first assignment as well as some on the job training. Workers are required to wear the specified uniform, which is provided by the SSA including durable protective gloves and steel-tipped boots; facemasks are also provided for the staff by the SSA although they are not always utilised.

8.6. Informal sector workers in the segregation and recycling of materials

There are no waste pickers at the waste disposal facilities in Barbados.

8.7. Presence of children and mothers who live and work in the garbage

There are no mothers or children who live and work in the garbage in Barbados. No persons live or work in the garbage as there are no waste pickers in Barbados.
9.1. Future needs for investment and for institutional reorganisation

For Small Island Developing States (SIDS) like Barbados, solid waste management is a serious challenge with respect to environmental management and therefore SWM seeks to address all types of solid waste including generation, setting out, storage, collection, transportation, processing, recovery and disposal of wastes. A multi-sectoral, multi-disciplinary approach has been therefore adopted to enhance the effectiveness of SWM in Barbados.

In terms of investment and infrastructure and institutional strengthening, the needs were identified and covered by the existing IDB loan agreement for the ISWMP. Subsequently, a review of the needs of the sector was undertaken and the additional needs identified are currently being financed by the GOB. Outside of the comprehensive framework for the ISWMP there appears to be little or no further investment needs for the short to medium term. Nevertheless, the strategic plan for the solid waste sector requires that the plans for the sector be reviewed every 3 years to identify any issues that need to be addressed in the appropriate way.

Further, there has been a surge of private sector investment proposals for the SWM sector and it is expected that as this surge continues to grow it will attract increased private sector investment over the short and long term.

9.2. Reform and modernisation to correct problems and increase the effectiveness and efficiency of solid waste management

It is Government’s intention that all residents should have access to a convenient, reliable, well-organised and cost-effective solid waste management system. The promotion of activities at the community and household levels seeks to encourage environmental stewardship and convey a sense of environmental responsibility with respect to waste management.

The ISWMP is looking to incorporate effective solid waste management into the business sector and one way of accomplishing this is the proposition of economic incentives and disincentives and appropriate legislation. There is thus an economic component which includes:-

- The revised Returnable Containers Act that would seek to implement a deposit on reusable and recyclable containers and thus encourage recycling
- The Sanitation Service Authority Act, Sanitation Service Authority (Fees) (Amendment) Regulations (1996) that would allow for the charging of a Bds $25 fee for every tonne or part thereof of refuse at any refuse disposal site
- The Environmental Levy Act (1996), which provides for the imposition and collection of a levy on specific goods to assist in defraying disposal costs
- Licensing and permitting legislation that requires fees to be paid by solid waste management officers
- Concessions and bonuses to support waste reduction activities
- Fines and penalties for contravening the proposed comprehensive Solid Waste Management Act

The economic component of solid waste management also includes the identification of green products through eco-labelling. This process seeks to influence the purchasing decisions of the general public and through their purchasing power influence manufacturers and retailers to consider waste reduction strategies in their product selection and packaging.
Further, there is a proposal of socio-cultural initiatives to address solid waste management at the level of every citizen. This will be achieved through:

- The introduction of a comprehensive solid waste management education programme to stop illegal dumping island-wide
- Incentives for environmentally sound projects and programmes
- Clean-up of natural drainage courses
- Cleaning of existing gullies and wells

There have been very few instances where individuals or organisations have been prosecuted for contravening laws relating to solid waste management. There is a clear need to sensitise the judiciary and the law enforcement agencies in this respect; also persons involved in the collection and presentation of evidence admissible in court need to be properly trained to carry out these tasks.

Because of the multi-sectoral, multi-disciplinary approach to SWM, there has been division of responsibility for related functions. For example, the operational and regulatory functions have been separated so that the EED has the overall regulatory responsibility while the SSA is responsible for operational functions. However, there needs to be transparency and free flow of information between the agencies to maximise the efficiency of the sector.

**9.3. Alternatives and suggestions to increase the effectiveness of solid waste management services**

The GOB is looking to involve the private sector in more aspects of SWM. Presently the private sector is involved in collection, transportation and recycling of solid waste only but will soon be involved in waste disposal and other non-physical components of the programme.

**9.4. Arrangement of the solid waste management sector**

The figure below illustrates the arrangement of the solid waste management sector in Barbados (adapted from Mc Calla 2002).
Figure 2: Arrangement of the solid waste management sector

- **Minister of Health**
  (Policy Development and General Coordination)

- **Environmental Health Officers**

- **Sanitation Service Authority**
  (collection and Operations)

- **Ministry of Public Works and Transport**
  (Maintenance of Roadways)

- **Sewerage and Solid Waste Project Unit**
  (ISWMP Project Implementation)

- **Environmental Unit/Division**
  (Assist in Education, Public Awareness and Legislation)

- **Environmental Engineering Division**
  (Monitoring and Enforcement)

- **Law Enforcement Agencies**
  (Enforcement of Regulations)

- **Private Sector Agencies/NGOs**
  (Education, public awareness, collection, transport, disposal and waste minimisation)

- **Division of Economic Affairs**
  (Public Investment Unit)
  International project financing administration

- **Attorney General's Office**
  (Drafting and revision of legislation)
9.5. Regulation of the services

The Health Services Act (Cap 44) defines the regulatory framework for SWM in Barbados and establishes its overall responsibility in the MOH, however, the private sector collection and transportation services are unregulated.

9.6. Subsidy policies

The GOB would consider, encourage and facilitate projects and programmes that utilise waste minimisation techniques. Plans of a waste exchange programme between various sectors of the industry may be utilised as an input for the manufacture of a new product in another industry. The synergy between industries would be encouraged and reinforced with appropriate incentives, disincentives and rewards.

At present the GOB assists private sector initiatives through the provision of tax concessions for the manufacturing sector. These include duty-free concessions on vehicles and equipment imported for use within the sector. In addition, inputs to recycled products for export are Zero Rated with respect to Value Added Tax. The Returnable Containers Act provides for a refundable deposit for beverage containers that allow recyclers to be paid a portion of the deposit. In addition, the public education and awareness programmes with respect to solid waste management that is fully financed by the GOB, provide opportunities for free advertising, brochures and on the SSWPU’s website. Apart from the above-mentioned provisions, all other requests for financial concessions are treated on a case-by-case basis.

9.7. Estimate of financial requirements to increase the coverage and quality of the services for the next 10 years

Emphasis is placed on delivery of improved management, treatment and disposal of waste. The budget is allocated for the improvement of existing SWM facilities as well as the design and construction of new facilities. The new physical facilities include the Solid Waste Management Centre, which is composed of a transfer Station, Chemical Waste Storage Facility and Composting Facility. The estimated cost of the design and construction of the new facilities is approximately Bds $36 million, while the projected annual operation cost of these facilities is estimated at Bds $9 million.

9.8. Recommendations to overcome the identified problems with emphases on medium cities and depressed urban areas

In some areas access to households has been difficult because of the limited width of the access routes. In such areas, intermediate drop-off points utilising secured bins should be provided to service the households. In addition, the roads could be widened to accommodate small refuse collection vehicles.

There needs to be improvement on existing signage relating to proper solid waste management. Signs present are cluttered with many words and are difficult to read as one drives by. More graphic signs with fewer words and catch phrases would be more attractive and easier to read.

In addition to this there should be continuation of the extensive education and awareness component of the ISWMP, both formal education and informal education, to allow more persons to become aware of solid waste management. These recommendations are all included in the strategic plan for solid waste management in Barbados.
10. BIBLIOGRAPHY


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### 11. Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AG</td>
<td>Attorney General</td>
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<tr>
<td>Bds</td>
<td>Barbados</td>
</tr>
<tr>
<td>BEYP</td>
<td>Barbados Environmental Youth Programme</td>
</tr>
<tr>
<td>CBO</td>
<td>Community Based Organisations</td>
</tr>
<tr>
<td>CCA</td>
<td>Caribbean Conservation Association</td>
</tr>
<tr>
<td>CZMU</td>
<td>Coastal Zone Management Unit</td>
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<tr>
<td>EED</td>
<td>Environmental Engineering Division</td>
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<td>EU</td>
<td>Environmental Unit</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>GOB</td>
<td>Government of Barbados</td>
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<tr>
<td>IDB</td>
<td>Inter-American Development Bank</td>
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<tr>
<td>ISWMP</td>
<td>Integrated Solid Waste Management Programme</td>
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<tr>
<td>MOH</td>
<td>Ministry of Health</td>
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<tr>
<td>MPE</td>
<td>Ministry of Physical Development and the Environment</td>
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<tr>
<td>MPT</td>
<td>The Ministry of Public Works and Transport</td>
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<tr>
<td>MSW</td>
<td>Municipal Solid Waste</td>
</tr>
<tr>
<td>MTI</td>
<td>Ministry of Tourism and International Transport</td>
</tr>
<tr>
<td>NCC</td>
<td>The National Conservation Commission</td>
</tr>
<tr>
<td>NGO</td>
<td>Non Governmental Organisation</td>
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<tr>
<td>NIMBY</td>
<td>Not In My Back Yard</td>
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<tr>
<td>PAHO</td>
<td>Pan American Health Organisation</td>
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<tr>
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<td>Small Island Developing States</td>
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<td>The Sanitation Service Authority</td>
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<td>Solid Waste Management</td>
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<td>SSWPU</td>
<td>Sewerage and Solid Waste Project Unit</td>
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<tr>
<td>UWI</td>
<td>University of the West Indies</td>
</tr>
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The National Coordinating Group for the regional evaluation of solid waste management in Barbados comprised of the following members:

- Mrs. Sandra Prescod-Dalrymple - Project Manager - Sewerage and Solid Waste Project Unit, Ministry of Health (Chairman)
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