

SOLID WASTE MANAGEMENT PROGRAM

(BA-0025)

EXECUTIVE SUMMARY

BORROWER AND GUARANTOR: Government of Barbados

EXECUTING AGENCY: Ministry of Health and the Environment

AMOUNT AND SOURCE:

IDB:	US\$ 13,000,000
Local counterpart funding:	US\$ 8,000,000
Total:	US\$ 21,000,000

FINANCIAL TERMS AND CONDITIONS:

Amortization period:	20 years
Disbursement period:	3 years
Interest rate:	variable
Inspection and supervision:	1%
Credit fee:	0.75%
Currency:	U.S. dollars from the Single Currency Facility

OBJECTIVES: The objective of the project is to support the GOB in developing a modern, dependable, and efficient waste management system which properly protects the environment, improves the standard of public health in Barbados and fosters the participation of the private sector.

DESCRIPTION: The project will consist of the following components: (1) a system of final waste disposal facilities (US\$13.9 million); (2) environmental education and waste-reducing promotion activities (US\$1.4 million); and (3) institutional strengthening and studies (US\$1.4 million).

The final disposal system will include the construction and operation of four key components: (i) an engineered sanitary landfill (US\$5.9 million); (ii) a transfer station and transfer equipment (US\$3.2 million); (iii) a bulky waste landfill (US\$0.31 million); and (iv) a yard waste composting facility (US\$2.85 million). This component will also include road improvements (US\$1.05 million).

The education component is aimed at promoting waste minimization activities, as well as, reducing unsightly placement of refuse in inappropriate public spaces. The component includes: (i) consumer

education (media campaigns, printed material); (ii) seminars and technical assistance at community level for backyard composting and; (iii) technical assistance for waste audits to business and industry.

The Environmental Engineering Division and the Sanitation Service Authority--which will become the Waste Management Corporation--will be strengthened. The component includes: (i) training in technical and operational aspects of solid waste management; (ii) technical assistance in accounting and financial procedures; (iii) assistance and training in contract administration; (iv) office equipment and; (iv) environmental monitoring equipment. The studies will cover: (i) financial mechanisms for cost recovery; (ii) improvement of collection and containment of solid waste; and (iii) hazardous waste disposal.

**ENVIRONMENTAL
AND SOCIAL REVIEW:**

The environmental aspects of the project are overwhelmingly positive derived from the education to raise public consciousness on waste management and the need for waste reduction and recycling; improved collection of refuse; improved institutional capability, regulation and policy; improved final disposal and control of illegal dumping. The negative environmental aspects will be mitigated with the implementation of an environmental management and monitoring program to be supervised by the country's environmental authority. The recommendation of the Committee of Environmental and Social Impact are in paragraph 3.26. The Environmental Impact Assessment was made public on August 28, 1995.

BENEFITS:

The proposed Program will result in significant environmental and health benefits from improved collection, transportation, disposal and the reduction of littering and illicit dumping. This will lead to a cleaner environment, less water and soil pollution, with a positive impact on quality of life, recreation and health.

From the economic point of view, the benefits of the Program can be measured as foregone damage costs if the Program is not implemented. These are principally: (i) losses in tourist revenue; (ii) costs associated with increasing nuisance associated with overall solid waste mismanagement; (iii) costs associated with health problems; (iv) costs associated with loss of environmental ecosystems; and (v) replacement costs of contaminated groundwater resources.

RISKS: The proper operation of the Greenland landfill is essential to the success of the project. The landfill's location within the boundaries of a proposed National Park would make any environmental problems arising from the mismanagement of the landfill all the more severe. There is a risk of pollution if strict compliance with the operational procedures are not followed. Operational manuals have been prepared and private sector involvement has been proposed, to ensure operations are at the highest standards.

There is a risk in not finding a suitable private sector operator with the recognized expertise and capability to carry out this task. To minimize this risk, an international consulting firm has been hired to assist the Government of Barbados to prepare tender and bidding documents and help during the process of contracting the operator. The bidding process will be completed during 1998.

POVERTY TARGETING: This program does not fall within the social equity and poverty reduction category (document AB-1704, paragraph 2.13), nor does it qualify as a poverty targeted investment (document AB-1704, paragraph 2.15)

THE BANK'S COUNTRY AND SECTOR STRATEGY: The Bank's current Country Paper sets forth a strategy focused on helping the country achieve sustained growth and continued social development. One of the key elements is avoiding and reversing environmental degradation. The priority areas set for the Bank are: sanitation facilities for prime tourism areas, solid waste management, control of beach erosion, protection of ground water resources, and implementation of a comprehensive regulatory policy for environmental protection.

PROCUREMENT METHOD: The procurement of goods and services, the contracting of works, and consulting services will take place in accordance with Bank policy. International competitive bidding will be obligatory for purchases of more than US\$250,000 for goods and services and US\$1.5 million for construction works. For the hiring of the private operator of the disposal facilities, prequalification by international invitation to bid will be used. The bidding of amounts below these ceilings will take place in accordance with local legislation.

**SPECIAL
CONTRACTUAL
CONDITIONS:**

Special actions to be undertaken prior to first disbursement:

(i) The first disbursement of the financing shall be subject to the implementation, to the satisfaction of the Bank, of the decision of the Government to award the contract for the private operator to design, build, operate, and maintain the transfer station and the composting facility, and to operate and maintain the Greenland landfill (see paragraph 3.3).

Other conditions

(i) Recognition of local counterpart contribution. The Bank may recognize as local counterpart contribution the equivalent of US\$4.7 million corresponding to the expenditures in the construction of the Greenland landfill as established in paragraph 3.19 and incurred up to 18 months prior to approval of the loan.

(ii) Retroactive financing. The Bank may finance retroactively up to US\$1.4 million corresponding to the engineering supervision and partial expenditures in the construction of the Greenland landfill as established in paragraph 3.19 and incurred up to 12 months prior to approval of the loan.

(iii) Environmental monitoring. The results of the environmental monitoring to be carried out by the borrower, according to the specifications set forth in the operational manuals of the solid waste disposal facilities, shall be shared with the Bank on an annual basis within the 90 days following the end of each calendar year during the period of project execution and for five (5) consecutive years thereafter (see paragraph 3.26).

(iv) Environmental education, waste reduction and institutional strengthening components. The disbursement of the financing related to the environmental education, waste reduction, and institutional strengthening components shall be subject to completion of the design of the Government's program.

I. BACKGROUND

A. Macroeconomic aspects

- 1.1 The Barbados economy recorded a real gross domestic product growth of 4% in 1997, reflecting the continuation of strong growth over the past four years. The export sectors grew by 5.6%, buoyed by good performance of tourism and sugar. Overall total tourist arrivals reached a record number of 472.300 in 1997, representing an annual growth of 5.6%. The 1997 sugar crop yielded 64.613 tons, 9.3% above output in 1996. Unemployment rate was reduced to around 14.7% for the year from 15.8% in 1996.
- 1.2 Government incurred a smaller fiscal deficit on its operations in 1997 mainly as a result of a significant increase in tax revenues, due to the introduction of a value added tax. The overall deficit was estimated at 0.7% of GDP at current market prices, compared with 2.6% of GDP in 1996. Current expenditures rose by 5.3% with interest payment falling for the first time in three years, due to declining external debt and low interest costs of domestic debt.
- 1.3 With significant excess of liquidity in the banking system, commercial banks provided the major proportion of government financing, and there was little need to borrow from the Central Bank. The average rate of inflation was estimated around 7.8% compared to 2.4% in 1996. The implementation of the value added tax resulted in sharp rise in retail prices.
- 1.4 Growth of about 3% is expected in 1998 and over the medium term. Continued investment in tourism-related projects is expected. The rate of inflation is expected to moderate to around 2.5-3% this year, with unemployment to remain at the level of 1997. An important policy issue emerging is the potential overheating of the economy, as a result in the increase in both public and private investment. This situation may fuel inflationary pressures, which may resulted in a more strict monetary policy.

B. The solid waste management system

- 1.5 Barbados' main tourist attractions are its beaches and natural beauty, and as such, the island depends on a clean environment, including proper waste disposal, to maintain adequate public health standards and its attractiveness to tourists. Indeed, tourist complaints about litter and scattered garbage are common. Barbadians and tourists together generate approximately 150,000 ton/year of solid waste. Since this waste is not efficiently managed, both groups suffer from the environmental and aesthetic degradation, and face the health risks imposed by current conditions. Reasons for the lack of appropriate management include: (i) current disposal practices of waste; (ii) inefficient collection service and containment practices; and (iii) low waste minimization practices in the country.

1. Waste disposal practices

- 1.6 Solid waste in Barbados is disposed at the Mangrove Pond landfill, the only waste disposal site on the island. Since Mangrove Pond began receiving refuse in 1985, waste has been dumped indiscriminately at this site, regardless of its toxicity. The inadequacy of a leachate containment system in the site left unprotected the quality of surrounding soil and groundwater aquifers, the latter a scarce resource in the country. Operating practices included the lack of appropriate compaction rates, which reduced the expected lifetime of the site, as well as the improper application of daily, intermediate and final cover material, which resulted in burning, dust, smoke, odor problems and pest infestation.
- 1.7 In regard to hazardous waste, current estimates indicate that less than 350 tons per year are directed to the Mangrove Pond site. However, its improper disposal has been creating potential contamination problems of the water supply. The country lacks information regarding types and volume of hazardous material, which is impeding the establishment of a facility for its appropriate management.
- 1.8 In April 1995, nearby residents' complained about health problems associated with smoke and the possible contamination of the water supply. As a result, a court injunction ordered the partial closure of the landfill. Since early 1995, additional resources were allocated to improve the management of the Mangrove Pond Landfill. With the help of consultants, a conceptual plan was prepared to reclaim the area, with the ultimate goal of closing the landfill. Remedial activities were carried out by the responsible agency, the Sanitation Service Authority (SSA), which resulted in the improvement of operations at the facility. The final closing will be carried out by SSA when the new disposal facilities are in operation.

2. Collection services

- 1.9 Around 56% of total waste is collected by the SSA as a public service. The remainder of commercial solid waste collection, and virtually all bulky waste collection, is performed by private collection companies. SSA crews collect about 1,120 tons of solid wastes per five-day week.
- 1.10 Collection services can certainly be improved by optimizing the routing system and avoiding frequent disruptions, both of which are currently producing an uneven service throughout the island. In addition, waste containment practices, by both residential and commercial generators, need to be corrected to reach minimum environmental and health standards.

3. Waste minimization practices

- 1.11 It is estimated that the private sector diverts 13,600 tons of recyclable, or less than 10% of the total waste stream. Of the total recycled waste, about 11,340 tons are paper (including newspapers), 910 tons are glass, 530 tons are non-ferrous metals, 500 tons are ferrous metals, 220 tons are polyethylene terephthalate, and 100 tons are lead acid batteries. Depending on the market for the specific product, most of the recyclable are being shipped overseas.
- 1.12 A national program for reducing waste at the source is being spearheaded and coordinated by the Government, with a national waste minimization goal of 40% by the year 2002. It is estimated that the reduction of waste at the source in Barbados will reduce the amount of solid waste being generated by about 3,700 tons per year, or about 3% of the total waste flow.

C. Regulatory framework

- 1.13 The Health Service Act defines the regulatory framework for solid waste management in Barbados and establishes its overall responsibility in the Ministry of Health and Environment (MOHE). Within the MOHE, three agencies play a leading role in the sector: (i) the Sanitation Services Authority (SSA); responsible for providing solid waste collection and disposal services, as well as street and drain cleaning services; (ii) the Environmental Engineering Division (EED), responsible for the control and monitoring of environmental impacts on natural resources; and (iii) the Environmental Unit (EU), responsible for facilitating environmental policy and planning on a national basis.
- 1.14 The Health Service Act comprises a large set of regulations. The *Collection and Disposal of Refuse Regulations* regulates landfill siting, littering and dumping, waste containment, and waste collection and transportation. Penalties are set for contravention of the Act. In addition, the Nuisance Regulation, the Rodent Control Regulation and the Disposal of Offensive Matter Regulation provide control over littering and dumping. Some of the regulations will need to be updated to follow the new environmental standards.
- 1.15 Other pieces of legislation relevant to solid waste management include the *Underground Water Control Act*, which regulate disposal of sewage or waste into the ground via water wells; and the *Returnable Containers Act*, which creates a system for recycling.

D. Current Government actions

- 1.16 In June 1996, the Solid Waste Policy Paper was approved by Cabinet. This document redefined the roles of the EED and the SSA. The EED will be responsible for the regulatory aspects which will include the setting of standards, environmental monitoring, licensing of

hauler vehicles and disposal facilities and enforcement of the Health Service Act. The SSA will continue to be the institution responsible for operational aspects of solid waste management. The Cabinet has approved the strengthening of the SSA, the operational responsibilities of the EED have transfer to the SSA. The responsibility for cleaning streets and storm drains have been transferred from SSA to the Ministry of Public Works.

- 1.17 The Policy Paper also fosters private sector participation in all aspects of solid waste management: collection, recycling and in the operation and management of the new disposal facilities. It addresses issues regarding environmental monitoring requirements in disposal facilities, composting and recycling.
- 1.18 The GOB has taken an important step towards the financial sustainability of the solid waste management in the island. Tipping fees have been established for commercial solid waste and yard waste, to be implemented when the new disposal facilities are in operation. The Environmental Levy Act, enacted in May, 1996 to defray the cost of the disposal of imported refuse and of operating and maintaining refuse disposal sites has been implemented as of July 1997.

E. Bank strategy for Barbados

- 1.19 The Bank's current Country Paper sets forth a strategy focused on helping the country achieve sustained growth and continued social development. One of the key elements is avoiding and reversing environmental degradation. The priority areas set for the Bank are: sanitation facilities for prime tourism areas, solid waste management, control of beach erosion, protection of ground water resources, and implementation of a comprehensive regulatory policy for environmental protection.
- 1.20 The proposed project is directly related to this strategy. It will improve the efficiency of public services by addressing the current inefficiencies in waste collection and management. Furthermore, by improving solid waste management and increasing composting and recycling efforts it will help Barbados deal with one of its most pressing environmental concerns, as well as improve the overall environmental health of the island.

F. Experience in the sector

- 1.21 The Bank has no previous experience financing solid waste management activities in the country. The MOHE, through the Sewerage and Solid Waste Project Executing Unit (PEU), has been responsible for the execution of the Technical Cooperation to prepare the solid waste management program (ATN/JF-3862-BA) and the construction of the south coast public sewerage system (loans 709/OC and 710/OC-BA), which started physical execution in late 1994 and the pre-investment loan (717/OC-BA) to finance feasibility

studies and find designs for another public sewerage system on the west coast and a water resources management plan.

G. Design of the project

- 1.22 The Integrated Solid Waste Management Program seeks to improve environmental and health conditions on the island, upgrade public services, and address the deficiencies in solid waste management that have led to environmental contamination, public dissatisfaction, and the risk of damaging the island's tourism industry.
- 1.23 The project fosters private sector participation through a public/private partnership, with the EED as the environmental supervisor, and the new SSA in charge of operational aspects, including the collection of residential refuse, and engaging the private sector (both domestic and foreign) in a contractual arrangement to build and operate the new disposal facilities. The SSA, with the assistance of qualified consultants, will select the firm or consortium and later administer the contract for the operation and management of the new disposal facilities by a reputable private operator. EED will enforce and monitor the environmental regulations. Both institutions will be strengthened to fulfill the new roles.
- 1.24 Greenland at the Scotland district, in the northern part of the island was the selected site to locate the national sanitary landfill. The location of the site requires the operation of a transfer facility, which must be conveniently located near the waste centroid in the southern part of the island to minimize travel by collection vehicles. A site within six kilometers of the waste centroid has been identified at Vaucluse in the parish of St. Thomas, adjacent to the existing Mangrove Pond landfill.
- 1.25 The GOB decided to proceed with the construction of the Greenland landfill as soon as the overall feasibility of the project was established. The construction of the landfill was finished in August of 1997 following strict technical and environmental requirements.
- 1.26 The diversion of solid waste is an integral part of the disposal strategy and will result in significantly less demand for landfill space. The diversion of bulky waste (the portion of solid waste that is not contaminated by the presence of putrescable or leachable materials) will result in a reduction of 34% of the volume of solid waste. Composting will reduce landfill needs by some 22%, while creating a useful product. Recycling has the potential to reduce the volume of solid waste by 9%. The transfer system will significantly reduce the number of daily trips to the landfill by waste collection vehicles. Suitable sites for bulky waste disposal have been located at the old Bagatelle quarry and the composting facility will be part of the complex at Vaucluse States.

- 1.27 Environmental education and waste reduction activities will be an important part of the strategy. It will include a broad campaign directed to target audiences (general community, residential and commercial refuse generators, tourist and private waste haulers). Direct and indirect approaches will be used: media outreach, public spaces, schools, hotels and illegal dump sites.
- 1.28 The proposed program is a set of coordinated, comprehensive systems and activities that together will address the management of solid waste in Barbados, from the source of the solid waste to its final disposal.

II. THE PROJECT

A. Purpose

- 2.1 The objective of the project is to support the GOB in developing a modern, dependable, and efficient waste management system which properly protects the environment, improves the standard of public health in Barbados and fosters the participation of the private sector.

B. Description of the project

- 2.2 The project will consist of the following components: (1) a system for final waste disposal facilities; (2) environmental education and waste-reducing promotion activities; and (3) institutional strengthening and studies.

1. Final disposal facilities

- 2.3 The final disposal system will include the construction and operation of four key components: (i) an engineered sanitary landfill; (ii) a transfer station and transfer equipment; (iii) a bulky waste landfill; and (iv) a yard waste composting facility. This component will also include road improvements.

a. Sanitary landfill (US\$5.9 million)

- 2.4 The Greenland below-ground sanitary landfill is expected to provide twenty years of space for solid waste at a rate of approximately 500 tons per day of waste material. The development of the first two cells will provide space for approximately 7 years of operation. Design base grades have been set to provide a balance between excavated soil quantities and estimated cover material requirements. A 1.0 m thick recompacted clay liner will be placed over the entire area of the final landfill footprint in order to eliminate the risk of soil and groundwater pollution.
- 2.5 The works included: excavation of 655,000 m³ of soil, a new access road, weight scales, a storm water storage pond, 110,000 m³ of liner, drainage and diversion channels, a containment pond system, a leacheate collection system, perimeter drainage, a storage building, general landscaping and a perimeter fence. Additional cells will be needed after the first two cells are filled.

b. Transfer station (US\$3.2 million)

- 2.6 The transfer station will be built at Vaucluse, adjacent to the existing Mangrove Pond landfill. Private haulers and collection vehicles will deliver wastes to the transfer station which, in turn, are then compacted and taken to the landfill by way of transfer vehicles. The works include the construction of a covered building with two-distinct dumping areas for the collection

vehicles, a central bay for the transfer equipment, weight scales and separate storage areas will be provided for recyclable materials. The facility is expected to handle approximately the 136,500 tons/year and a peak waste acceptance rate of 80 tons/hour.

- 2.7 The transfer equipment will be self-unloading trailers with walking floors or other self-unloading mechanisms. The equipment will be secured and no spillage or blowing wastes will be allowed.

c. Bulky waste disposal landfill (US\$0.31 million)

- 2.8 A bulky waste disposal landfill for inert materials will be upgraded. The abandoned limestone quarry at Bagatelle (St. James) has been identified as the initial bulky waste disposal site. The design has been developed based on the use of the existing quarry as a reclamation project for the next 6 to 8 years. The proposed works include: a perimeter fence, upgrade of the access road, installation of weight scales and the construction of a small leachate collection pond.

d. Composting facility (US\$2.85 million)

- 2.9 A compost facility will be constructed and operated as part of the Vauclose Estates complex to divert some 20,400 tons per year of organic yard and garden waste. The process will produce a useful material for agricultural purposes, as well as reduce the quantity of waste (14%) that needs to be disposed by landfilling.
- 2.10 The works include the construction of: dedicated compost haul roads, a compost preparation area (1,500 m²), a covered compost slab (5,300 m²), an open compost windrow storage (2.5 hectares), a laboratory and office facilities. The process area will be designated for a peak rate of 9 tons per hour with residence time in the covered area of approximately 4 weeks. Storage in the windrow area will provide another 10 weeks of retention and maturation time.

e. Road rehabilitation (US\$1.05 million)

- 2.11 To ensure the safe transport of solid waste, especially from the Transfer station to the Greenland landfill, a road rehabilitation component is proposed for 3 critical links: Highway 2 between Farley Hill and Greenland (2.9 kilometers); Highway 2A between Mile and a Quarter and Alleydale (1.45 kilometers); and Mangrove road between Highway 2A and Vuaclose road (1.8 kilometers). The works will include: covering of box drains, construction of side walks and retaining walls, recapping of road surface, junction and curve improvements.

2. Environmental education and waste reducing activities
(US\$1.4 million)

- 2.12 This component is aimed at promoting waste minimization activities as well as reducing unsightly placement of refuse in inappropriate public spaces. The following activities will be carried out: (i) a consumer education through media campaigns, printed material and seminars; (ii) seminars and technical assistance at community level for backyard composting; (iii) technical assistance for waste audits to business and industry and; (iv) recycling incentives.
- 2.13 Activities within the community will include warning signs, optional depositories such as permanent and temporary litter barrels in public spaces or skips at dumpsites, drop-off depots for recyclables, clean-up and collection events. The enforcement programs will deter would-be dumpers with the threat of existing litter laws. Warning notices and strike-force enforcement teams, with health and environmental inspectors will be used. The enforcement will be prioritized according to a ranking of problem sites, already identified as illegal dumping sites.

3. Institutional strengthening and studies (US\$1.4 million)

a. Strengthening

- 2.14 The SSA will be strengthened in financial and technical management and contract administration. The activities will include: (i) training in technical and operational aspects of solid waste management; (ii) technical assistance in accounting and financial procedures; (iii) assistance and training in contract administration and project management; (iv) office equipment to improve the technical and financial systems.
- 2.15 The project will provide for the training of environmental officers of EED to review applications for permits or licenses, and training of inspectors for environmental monitoring. The laboratory and field equipment will be purchased to collect and monitor water, air and soil contamination.

b. Studies

- 2.16 Specific studies will be performed under this component in the areas of collection, hazardous waste disposal, and cost recovery mechanisms. As a means of improving the collection and containment, an indepth study will be contracted to optimize the routing structure, schedules and containment procedures. The goals will be to maximize the efficiency of refuse collection, to separate the material for composting purposes, to provide a one per week minimum collection to every household and to facilitate separation of refuse at the source. With its own resources, the SSA will implement the recommendations to optimize the collection routes of the residential areas with its own resources following the findings of the study.

- 2.17 Because there are currently no facilities for hazardous waste management in Barbados, the conceptual plan for a hazardous waste management facility is generic (it will treat all kinds of hazardous waste with only one procedure). A comprehensive hazardous waste inventory is being conducted by the MOHE with the help of consultants. All the special waste will be sorted and properly disposed at the Greenland landfill. The GOB is looking into the incineration of the toxic waste using the cement kiln facility of the new Arawak plant, as well as other alternative disposal technologies.
- 2.18 Finally, GOB will have assistance to address the issue on the solid waste policy paper, studying suitable financial mechanisms to recover both capital and operating cost for collection and final disposal of solid waste from residential and commercial sources.

C. Cost and financing

- 2.19 The cost have been based upon final construction designs for the Greenland landfill and conceptual design for the other facilities presented by the international engineering firm contracted with resources from ATN/JF-3862-BA. The road rehabilitation has been estimated based on preliminary designs from a local engineering firm. The cost of the studies, environmental education and institutional strengthening were based upon the feasibility studies. All costs have been updated to August of 1997. Land acquisition for the Vaocluse Complex is estimated about US\$900,000
- 2.20 The total cost of the project is estimated at US\$21.0 million equivalent, of which the Bank will finance up to US\$13.0 million equivalent, or 62% of the total project cost from ordinary capital resources. In addition to the Bank's financing, the GOB will finance the local counterpart of US\$8.0 million equivalent. The following table shows the components contributing to the costs of the program.

COST AND FINANCING
(US\$ THOUSANDS)

CATEGORIES	IDB	LOCAL	TOTAL	%
I ENGINEERING	900	870	1,770	8.4
1.1 Project engineering	900	400	1,300	6.2
1.3 Administration	0	470	470	2.2
II DIRECT COST	9,800	6,900	16,700	79.5
2.1 Disposal facilities	7,000	6,900	13,900	66.2
2.4 Environmental education	1,400	0	1,400	6.7
2.5 Institutional strength.	1,400	0	1,400	6.7
IV UNALLOCATED	1,250	140	1,390	6.6
4.1 Contingencies	1,100	120	1,220	5.8
4.2 Escalation	150	20	170	0.8
V. FINANCIAL COST	1,050	90	1,140	5.4
5.1 Interest	920	0	920	4.4
5.2 Commitment fee	0	90	90	0.4
5.3 FIV	130	0	130	0.6
TOTAL	13,000	8,000	21,000	100.0
Percentage	61.9	38.1		

1. Terms of financing

- 2.21 Financing will be from the Single Currency Facility with repayment over 20 years at variable interest, a 0.75% credit fee, and a 1% inspection and supervision charge. The disbursement period will be 3 years from the date of approval.

III. EXECUTION OF THE PROJECT

A. Executing agency

- 3.1 The MOHE would be the executing agency for the project. The PEU for the proposed project would be the Sewerage & Solid Waste Project Unit of the MOHE. As noted, this Unit has been responsible for the preparation of the Solid Waste Management Study, as well as construction of the national sanitary landfill at Greenland.
- 3.2 The organization of the PEU would remain unchanged for the execution of the project. The project director will head the unit and supported by a project engineer who will liaise directly with the consulting firm for engineering supervision. In addition, the PEU will be strengthened by the hiring of a suitably qualified finance officer for financial and accounting management of the project, including the preparation of periodic financial statements and disbursement requests to the Bank, as well as an administrative officer for day-to-day office management.
- 3.3 The proper staffing of the PEU with the assignment of a project manager, an experienced engineer, as well as the contract of the financial and accounting officers will be implemented by the GOB before Board approval.
- 3.4 The PEU would be primarily responsible for administration of the loan and would work in close collaboration with the SSA and the EED, which themselves will receive institutional strengthening, particularly assistance to the SSA in the operation of the new system and strengthening the capacity of the EED as environmental supervisor.

1. Mechanisms for execution of the project

- 3.5 The construction of the Greenland landfill was contracted in September 1996 and completed in August 1997, the site is ready to start operations. An international consulting firm was contracted in September 1996 to supervise the construction of the national sanitary landfill, as well as the construction of the transfer station and composting facility. An individual consultant has been hired to provide technical assistance in the selection and hiring of a private firm for the design, construction and operation of the transfer station and composting facility and the operation of all elements of the disposal system, including the landfill. A local firm has been hired through the Ministry of Public Works, Transport and Housing to prepare designs and supervise the reconstruction of access roads.
- 3.6 The GOB has agreed that the private sector will operate the disposal facilities via management contract. The private sector proponents will be required to design-build and operate the transfer station and composting facility, operate and maintain the

Greenland landfill and own the mobile assets. To achieve efficiency a system of penalty/bonus will be incorporated into the private operator's contract. The incentive will maximize compact waste density (CWD) and conserve the capacity of the landfills; a penalty amount for falling short of the target CWD (750 kg/m³ in the sanitary landfill, and 800 kg/m³ in the bulky waste landfill) and a bonus for exceeding the target CWD. The GOB will control the overall quality of the system, collect revenues and retain ownership of all fixed assets.

- 3.7 A draft Request for Proposals (RFP) has been prepared to be used in hiring the private operator; proposals have been received and evaluated during the third quarter of 1998. Based on the measures and procedures already in place, construction of the physical facilities could proceed by the first quarter of 1999.
- 3.8 The consulting firms will execute the environmental education and waste reduction activities, as well as the studies under the institutional strengthening component, under the supervision of MOHE and the WMC. In the case of the study of cost recovery, the GOB will share with the Bank the results of the studies, and will follow up actions as the Government deems appropriate.
- 3.9 The execution of the institutional strengthening activities will be phased to ensure that the SSA and the EED are adequately prepared to supervise and monitor the disposal operations once they begin. The MOHE will submit to the Bank a final revised program for environmental education, waste reduction activities, hazardous waste disposal and a final detailed list of the institutional strengthening activities as a condition prior to first disbursement.

B. Implementation schedule

- 3.10 Implementation includes the execution of four contracts for construction of physical works for the following facilities: (i) the first stage of the national sanitary landfill at Greenland; (ii) a transfer station, composting facility and ancillary site works at Vacluse, (iii) ancillary works and access road to the bulky waste site at Bagatelle; and (iv) upgrading of sections of the road to Vacluse and Greenland. As noted in paragraph 3.5, the construction of the first stage of the landfill, which has a capacity of five to seven years, was completed in August 1997. Construction operations for the transfer station and composting facility are planned to begin in the second quarter of 1999. Ancillary works at the Bagatelle bulky waste site, as well as upgrading of sections of the main road to the landfill, are scheduled to commence in the first quarter of 1999. The construction of all physical works for the project is scheduled to be completed by the fourth quarter of 1999.
- 3.11 In addition to the physical works, other activities to be financed include: (i) additional studies and technical designs which were

outside the scope of the consultancy for the feasibility studies; (ii) technical assistance in the preparation of bidding documents and the hiring of a private sector firm for the design/build/operate contract; (iii) environmental education campaigns; and (iv) institutional strengthening of the agencies responsible for supervision, monitoring and regulation of the operator. Annex II presents a tentative timetable of the calls for bids and the estimated amounts involved.

- 3.12 The request for qualification and proposals to contract the private operator are under preparation. The international invitation for expressions of interest have already been published. The awarding of the contract constitutes a condition prior to first disbursement.

C. Procurement

- 3.13 Bank procedures will apply in the procurement of works, goods and consulting services. International competitive bidding will be obligatory for purchases of more than US\$250,000 for procurement of goods and related services and US\$1.5 million for construction works. For the selection of the private operator of the disposal facilities, prequalification by international invitation to bid will be used. The bidding of amounts below these ceilings will take place in accordance with local legislation.
- 3.14 The contract for the design/build of the transfer station and composting facility (estimated cost US\$6.1 million) will be awarded to one firm. Bids will be submitted in two parts. The first, for the physical facilities, will be a fixed price contract covering the construction of on-site civil works and the provision and installation of other fixed assets. The second will be a seven-year contract for the provision of equipment and all other resources necessary for operation of the waste disposal system. A system of penalty/bonus will be included as explained in paragraph 3.6.
- 3.15 Regarding the civil works, the Bank's procedures for international public bidding, which included prequalification, were followed in the selection of the contractor for the landfill, at a cost of US\$10.5 million. Based on preliminary estimates, the cost of the site works at the bulky waste site and the access roads are below the limit for international competition; since the capacity exists within Barbados, contractors for these works will be tendered according to local procedures.

D. Execution period and investment schedule

- 3.16 The overall execution of the project would be three years from the date of the loan contract. The following Table presents a summary of the projected disbursement schedule, indicating the sources of financing. The substantial investments in the first year after loan signature reflect retroactive payments and recognition of

local counterpart contribution of approximately US\$4.7 million to cover a portion of the cost of the landfill, as well as early execution of other physical components, given the advanced state of project preparation.

INVESTMENT SCHEDULE
Direct cost (US\$000)

YEAR	IDB	LOCAL	TOTAL	%
1	9,800	6,900	16,700	90
2	600	500	1,100	6
3	300	370	670	4
TOTAL	10,700	7,770	18,470	100

E. Land acquisition

- 3.17 The property on which the landfill has been constructed has been acquired by the GOB. However, it will be necessary to acquire land for the transfer station and composting facility, and the GOB has begun negotiations with the property owner. Given the very small amount of land required and the provisions of Barbadian law which permit compulsory land acquisition for public use, no problems are expected in this regard. In keeping with the Bank's policy, before issuing calls for bids on works, the borrower will have to demonstrate to the Bank that it holds legal title to the lands on which the works are to be constructed. The purchase price of the land is included in the project cost and will be financed by counterpart funds.

F. Maintenance

- 3.18 The availability of adequate resources, including trained personnel to supervise and monitor the operations, is critical for the implementation of a proper collection and disposal system. The project provides resources for institutional strengthening. Within the first quarter of each year, beginning with the fiscal year after which the facilities are constructed and for 5 consecutive years, the SSA would submit to the Bank, in a format to be agreed upon, a report explaining that the facilities (landfill and transfer station) are maintained in accordance with the maintenance requirements specified in the operation and maintenance contract with the private operator.

G. Retroactive financing

- 3.19 At the Greenland landfill, the selection process for the consulting firm and the construction contractor was supervised by the Country Office to ensure that the Bank's procedures for international competitive bidding were followed in each case. It is proposed that, in addition to the cost of engineering designs not covered

under the ATN/JF-3862-BA, the Bank may recognize as part of the local counterpart contribution the equivalent of US\$4.7 million as part of the expenditures in the construction of the Greenland landfill and incurred up to 18 months prior to approval of the loan. The Bank may also retroactively finance up to US\$1.4 million corresponding to the engineering supervision and partial expenditures in the construction of the Greenland landfill and incurred up to 12 months prior to approval of the loan.

H. Supervision of the project

- 3.20 The Country Office in Barbados will be responsible for supervising the project. The Bank will establish inspection procedures so as to ensure satisfactory completion and verify compliance with agreed measures for environmental monitoring as part of the annual reports. The amount of US\$130,000 from the financing will be credited to the Bank's accounts to defray expenses for inspection and supervision.

I. Environmental aspects

- 3.21 Environmental issues and the environmental feasibility of the project have been considered from the pre-feasibility selection of potential sites for final waste disposal, the selection of a final site and the preparation of the institutional, legal, educational and technical aspects of the program. An in-depth environmental impact assessment (EIA) and a separate social impact assessment were conducted, the findings of which have identified and evaluated all environmental and social impacts, aided the development of mitigation and protection activities for execution, and have assisted in designing the bulky waste disposal facility, transfer station and landfill sites and activities. Operational guidelines have been prepared for the land fill, transfer station and the bulky waste site, and will be prepared for hazardous waste site operations.

1. Positive environmental impacts

- 3.22 The environmental aspects of this project are overwhelmingly positive and because of the approach taken (i.e. developing a comprehensive solid waste management program), benefits or positive impacts are derived from the totality of the program through its components, to wit: (i) education to raise public consciousness on waste management and need for waste reduction, source separation, and recycling; (ii) government incentives for recycling; (iii) improved collection; (iv) improved institutional capability, regulation and policy; (v) composting; (vi) separated bulky waste disposal; (vii) improved final disposal in a high technology, sanitary land fill; and (viii) hazardous waste collection, treatment and proper disposal.

2. Negative environmental impacts

- 3.23 The major potential negative impacts are associated with the land fill and the transfer station. Contamination of ground water from leachate and surface and ground water from runoff can be major problems if steps are not taken to contain and control these fluids. Air quality effects associated with the landfill, terrestrial ecosystem loss, terrain stability and erosion, land use alterations, increased truck traffic in the vicinity of the landfill, aesthetics, cultural/historical aspects and social considerations are additional potential problems.
- 3.24 Social impacts are minimal. No people or buildings will be relocated by the development of disposal facilities. The nearest habitation to the landfill is approximately 1.2 km upwind - a community of about 600 people. There will be no disruption of the daily life of this community. Noise impacts on the community from landfill heavy equipment operation will be diminished by their living up-wind from the facility. The nearest habitation to the transfer facility is approximately .5 km away. A small settlement surrounds the rim of the Bagatelle bulky waste facility (a 100+ m deep abandoned quarry) which could be affected by the noise and dust from vehicles depositing material into the pit and machinery crushing and moving waste and covering it.

3. Mitigation plan

- 3.25 A mitigation plan will be implemented, including:
- a. the control of ground and surface water quality, which will be accomplished by control of leachate and runoff.
 - b. Rain water that falls on the site will be retained in a catchment basin inside the landfill and only released if it meets water quality standards.
 - c. Landfill gas will be vented to the atmosphere to prevent build up within the landfill and potential explosion or fire.
 - d. Land slippage problems have been corrected through design and construction techniques, yet will be monitored to see if any movement is present.
 - e. The landfill has been constructed in such a way as to prevent view from the major road that passes in front of it. It has been well contoured and protected with vegetation as a visual barrier.
 - f. Road improvement is planned for the distance between the transfer station and the landfill. This will allow safe passage of large trailer trucks, 7-10 per day, to the landfill.

- g. Air quality and water monitoring programs have been developed to regularly sample and analyze landfill gas, ground water, leachate and surface water.
 - h. Strengthening of the SSA and the EED, in the form of training, equipment, personnel, transport, is provided by the loan and is aimed at assuring good operations for the facilities and the program, careful regulatory control and enforcement.
- 3.26 The following recommendations of the Committee of Environmental and Social Impact have been included: (i) to incorporate general and particular environmental considerations into the conditions and specifications of the construction tender documents; (ii) environmental standards to be included as part of the operational manuals for the disposal facilities; and (iii) the borrower will submit to the Bank an annual report on the mitigation and monitoring activities at the landfill transfer station, composting and bulky waste facilities.

IV. THE BORROWER AND EXECUTING AGENCY

- 4.1 The borrower of the loan will be the Government of Barbados and the executing agency will be the MOHE through a Project Executing Unit (PEU). The responsibility for the operation of the solid waste system will be held by SSA, referred in this section as the "operating agency".
- A. The executing and operating agencies
1. The executing agency
- 4.2 Under the Health Services Act of 1969, the Ministry of Health Ministry has the primary responsibility for the provision of all government health services, including planning, administration and project development of environmental and public health. In June 1995, responsibility for the Environment portfolio was vested with the Minister of Health to form the new MOHE.
- 4.3 The MOHE has in place the necessary policies and procedures to ensure that its financial resources are efficiently administered and controlled. To complement these procedures, the ministry's accounts are audited every year by the auditor general who, under the Financial Administration and Audit Act 1964, has the legal responsibility to conduct annual audits of all the public sector entities.
- 4.4 An evaluation of the MOHE's expenditures for the fiscal years 1992/93 to 1996/97 shows that, in addition to the costs related to administration and policy formulation, this ministry has been involved in four major areas: (i) primary health care services; (ii) hospital services; (iii) care of disabled; and (iv) pharmaceutical program.
- 4.5 In the past three years, expenditures in primary health care services have experienced a sharp increase, going from US\$20.7 million in 1994/95 to US\$52.4 million in 1996/97. This increase is mainly explained by the execution of the above referred South Cost Sewerage Program and the investment and concurrent costs already carried out for the Solid Waste Program.
- 4.6 As for the other activities referred above, expenditures in administration and policy formulation amounted to an annual average of US\$3.8 million during the fiscal years 1992/93 to 1996/97, hospital services averaged US\$50.7 million, care of disabled US\$1.6 million and pharmaceutical program US\$10.5 million.
2. The operating agency: SSA
- 4.7 Solid waste collection and disposal services are presently provided by the SSA, a statutory body of the Government of Barbados within the MOHE. The functions of the SSA are: (i) to remove refuse from

any premises as authorized by the Minister; (ii) to provide and maintain in a sanitary condition suitable places, buildings and appliances for the deposit, disposal and destruction of refuse; (iii) to provide and maintain public baths and public sanitary conveniences; and (iv) to provide and maintain cemeteries, burial grounds and crematoria.

- 4.8 The SSA is governed by a Board responsible for carrying out the general policies of the Government in all the functions of the SSA. The overall administration and operation is carried out by the General Manager, who is supported by the Deputy Manager and Senior Officials responsible for Finance, Personnel, Refuse Collection and Disposal, Mechanical Equipment, and Cemeteries.
- 4.9 At present, the SSA collects residential refuse and approximately 10% of the total commercial refuse of the island. The remaining 90% of this refuse is collected and disposed of by private companies and haulers. The fees charged by SSA for the service are approximately 1/3 of that charged by the private sector.
- 4.10 As a result of the construction of the new waste management system to be financed by the program, the Government of Barbados will acquire a transfer station, a landfill, and composting and bulky waste facilities. The SSA will operate these facilities with the assistance of the private sector, while being in charge of the operation of all weigh bridges, the setting of fees and the collection of revenues.
- 4.11 The need to restructure the SSA to meet its new role as a result of the new waste management system is widely understood and acknowledged. As the body ultimately responsible for the operation of the system, the SSA must be equipped with the ability to administer the contracts with the private sector. To this end, the SSA will recruit, or train, senior individuals who will be fully conversant with all the technical aspects of running a waste management system.
- 4.12 In accordance with the above, the Board of the SSA is moving towards the re-design of SSA to be consolidated as the principal agency for the coordination of all solid and related waste management in Barbados. This responsibility is currently shared between the SSA, the EED and a number of other agencies within the MOHE. The borrower will submit to the Bank, prior to first disbursement, the final restructuring proposal for the Sanitation Service Authority including a plan of action to reassign staff consistent with the goals of efficiency and the role and functions of the new WMC.
- 4.13 SSA would be responsible for all operational aspects of solid waste management, namely, collection, transport, treatment, composting and disposal of all wastes including bulky and hazardous wastes. The required restructuring and upgrading of SSA to enable its effective operation in the new system will include:

(i) transferring from EED of some of its current operational responsibilities that are related to waste management; (ii) transferring of street cleansing activities to the Ministry of Public Work, Transport and Housing; (iii) strengthening of technical capacity; (iv) changing the current cash accounting system for a financial accounting system that permits the generation of complete financial statements and provide management with appropriate tools to measure WMC performance; (iv) development of a system to generate financial resources to meet operating maintenance, depreciation and investment costs of existing and new solid waste management system; and (iv) privatization of part of the operations over a period of time as a means to achieve efficiency.

3. Financial analysis of the SSA

- 4.14 The SSA operates on a fiscal year ending on March 31. The financial statements are prepared in accordance with the Financial Administration and Audit Act and Rules that apply to all government statutory bodies, and are audited by the Auditor General. These financial statements are prepared on a cash accounting basis.
- 4.15 In the last three years, annual expenditures amounted on the average to US\$9,8 million, of which the cost of refuse collection and disposal accounted for approximately 50% of the total expenditures and the other activities --sweeping of streets, maintenance of public baths and maintenance of cemeteries-- the remaining 50%. Given the nature of the activities, labor represented around 70% of total cash expenditures. The cash-based accounting system used by SSA does not take into account depreciation of its fixed assets, which in fact are property of the MOHE and other ministries and not of SSA.
- 4.16 SSA's operations are mainly covered by budgetary transfers from the MOHE. These transfers are based on annual estimates of current and capital expenditures prepared by SSA and approved at the ministry level. The SSA generates some revenues mainly related to its refuse collection and cemeteries services. These revenues, which historically have represented about 2% of the cash expenditures do not represent income to SSA since they are transferred to the MOHE's treasury. Budgetary transfers from the MOHE, which have averaged 8% of the ministry's total expenditures, have in general been sufficient to cover the required cash expenditures at SSA.
- 4.17 As mentioned before, SSA intends to implement a system to increase its revenues. As a part of this system, a tipping fee has been set with the idea of at least covering landfill operating and maintenance costs, and will be effective as soon as the new landfill begins its operation.

V. VIABILITY AND RISKS

A. Technical and environmental justification

- 5.1 The Barbados Solid Waste Management Program supports the technically and environmentally viable minimum cost solution for solid waste disposal in the island. The program will provide a high level of protection for both human health and the environment, through the employment of the best practical design and operation. An assessment of technology options for final disposal was carried out during the Preinvestment studies. An engineered sanitary landfill was considered the best environmentally acceptable technical solution. The siting of the main facility was carefully scrutinized including technical, economic, social and economic criteria. The preliminary siting study included 17 potential sites around the island. The sites were ranked and the top three sites were shortlisted: Harrison Point, Lamberts and Greenland. Further detailed studies performed during the feasibility phase determined the Greenland site as the preferred option.
- 5.2 Final designs and bidding documents were produced for the Greenland landfill. Following Bank's bidding procedures the construction was awarded to Canada Carib International. The landfill will not start operations until the transfer facilities begin functioning.
- 5.3 To ensure a modern, affordable and dependable waste management system, private sector managerial expertise will be required. The areas of expertise include: transfer station operation, transfer operations, composting and landfill operation. The GOB will select and award a contract-partner with one or more private sector companies to operate the system on a fee-for-service basis. The GOB has contracted an international consulting firm to help select the appropriate contract-partner based on their response to a request for proposals comprising three elements: qualifications, technical proposal, and financial proposal. The institutional strengthening component will ensure that the GOB is properly equipped to administer the contracts and enforce suitable environmental regulations.

B. Economic viability

1. Benefits

- 5.4 From the economic point of view, the benefits of the Program can be measured in form of damage costs forgone or avoided damage costs if the Program is implemented. These are principally: (i) losses in tourist revenue; (ii) costs associated with increasing levels of nuisances associated with overall solid waste mismanagement; (iii) costs associated with health problems; (iv) costs associated with loss of environmental ecosystems; and (v) replacement costs of contaminated groundwater resources. The quantification of these

foregone damage costs is not possible; however, they are certainly expected to justify a project of this type.

2. Cost analysis

- 5.5 A least cost methodology was used to choose the final waste disposal method and location. The goal of the methodology was to choose an option that minimizes the discounted investment and operating cost given volume and environmental constraints. This methodology was performed in two phases: selection of a disposal method between landfilling and incineration, and selection of the location of disposal site. For all comparative analyses performed, costs were expressed in present value terms, using a discount rate of 12% and a 21-year planning horizon.
- 5.6 In the first phase, two options for final disposal were considered: a modern engineered sanitary landfill and incineration. Investment and operating costs for both options were estimated at the pre-feasibility level and included all elements to handle 400 tons per day (TPD) of municipal solid waste, as well as to minimize health and environmental risks and nuisances to the exposed population. The landfill alternative included high-quality lining, leachate collection and ongoing monitoring and control provisions. The incineration option is comprised of a modular mass burn facility with emissions control system, energy recovery, engineered landfill for disposal of bypass waste and engineering ash monofill. The present value of the incinerator was estimated in US\$81.3 million; almost 100% more expensive than the landfill option.
- 5.7 Given the results of the first phase, the location of the sanitary landfill was selected to minimize investment and operating, hauling, and infrastructure costs at feasibility level. For the selection of the site, 17 potential sites were considered using environmental and engineering criteria that included, among others: (i) availability of cover material; (ii) low impact of terrestrial/aquatic ecosystems; (iii) aesthetics; (iv) geology, topography and drainage; (v) groundwater resources; (vi) persons living in surrounding communities; and (viii) available infrastructure. Three sites were selected: Greenland, Harrison Point, and Lamberts.
- 5.8 Investment and operating costs for a 500-TPD sanitary landfill in each of the areas considered a standard compaction rate, as well as a suitable height and depth depending on soil characteristics, to estimate land, excavation, liner, and post-closure costs. Landfill development included appropriate leachate collection and disposal system, gas control, environmental and monitoring measures to prevent or control odor and pests, standard equipment and personnel, and daily cover material.
- 5.9 Investment and operating costs of the landfill took into account the implementation of two waste minimization options: a bulky waste site and a composting facility. The viability of each option

was evaluated by comparing the savings associated with the reduction in waste volume 1/ (i.e., lower investment and operating costs of a smaller landfill and lower hauling costs) with the investment and operating costs of each option. In the case of the bulky waste site, the investment and operating costs were estimated at US\$1.5 million; while the expected savings derived from it were US\$24 million. In the case of the composting facility, the investment and operating costs were estimated in US\$8.5 million; while the expected savings derived from it were US\$8.6 million. The latter savings do not consider aesthetic values in the reduction of current backyard burning practices and odor at the landfill site; non-quantifiable benefits from the economic point of view. Hence the expected net gains demonstrated the economic viability of both waste reduction options.

- 5.10 Hauling costs were not included in the cost comparison analysis because the three sites are at almost identical distance from the waste centroid located near the Bridgetown area 2/. Given the distance from waste centroid, the use of a transfer station was justified in economic terms when compared to the cost of direct hauling from the waste centroid (US\$18.7 million) 3/.
- 5.11 Infrastructure costs were also included for each site. These costs included: (i) road improvements; (ii) closure costs of existing landfill site at Mangrove Pond, which are zero in the case of Greenland since material could be obtained during the excavation of the site; and (iii) soil conservation works at Greenland.
- 5.12 The following Table shows the results of the cost comparison for the three alternative landfill sites. The results indicate that the site at Greenland represented the least-cost alternative; costs at either Harrison Point or Lambert were about 25% higher than those at Greenland.

1/ The waste volume reduces 35% if a bulky waste site is open and 12% in the case of the composting facility.

2/ Given that about 90% of total waste generated in Barbados is produced around the Bridgetown area, this one was considered as the only waste centroid in the country.

3/ The cost of the use of a transfer station includes investment and operating cost (US\$8 million), plus the transportation cost of waste to the landfill site (US\$4.7 million). The costs of direct hauling include the travel cost of current transportation equipment from the location of transfer station to the landfill. Costs do not include those associated with expected traffic congestion, stress on roads, and scattered litter lost on route.

COST COMPARISON ANALYSIS FOR SITE SELECTION
(in thousand of US\$)

COSTS	GREENLAND	HARRISON POINT	LAMBERTS
Investment & Operation	13,892	15,971	15,971
Infrastructure	1,113	2,922	2,762
TOTAL	15,005	18,893	18,733

C. Financial viability

- 5.13 The objective of the analysis was to determine the sufficiency of the tipping fees that have been set --although not charged yet--, and the new Environmental Levy, to cover the operating and capital costs of the new facilities. The main assumptions considered in this analysis were the following:
- a. The whole disposal system has been considered, except for the collection system.
 - b. The SSA expenditures will still be financed through MOHE's current budget, and costs associated with institutional changes in SSA have not been considered.
 - c. The projected income is based on a tipping fee of Bds\$25 per ton of commercial solid waste and Bds\$15 per ton of yard waste.
 - d. The projected operating and maintenance costs correspond to those of a reasonably efficient private operation.
 - e. An environmental levy projected at about US\$3.5 million per year has been considered.
- 5.14 As a result of this analysis, total projected revenues --tipping fees and environmental levy-- are estimated to cover almost 100% of operating costs of the new facilities. When depreciation and financial costs are considered, the level of coverage is approximately 70%. Since historically the government has been financing the whole waste system, this new situation should be considered as a major improvement from the financial point of view. Moreover, it should be pointed out that the above cost estimates are subject to change upon receipt of offers to operate the system from the private sector. At this point it can be inferred that the level of tipping fees and the environmental levy will be reviewed since the government is pursuing a new self financing system for the new facilities.

D. Benefits of the program

- 5.15 The institutional and operational enhancements will result in substantially improved levels of garbage collection from households

and other generation points. This will mean that there will be less garbage awaiting collection and disposal and less litter resulting from the dispersion of uncollected garbage by wind and animals. The enforcement will result in a reduction of illicit dumping and associated litter scattered about urban and country side environments. Litter and scattered garbage do not go unnoticed by tourists and visitors, and generally detract from the image of Barbados as a tourist destination.

- 5.16 The operation of the Transfer Station is essential to transportation efficiency and environmental protection. The transfer system will result in considerably less traffic congestion, less stress on the roads, and less litter being lost in route and scattered along the roads.
- 5.17 The diversion of solid waste, as proposed for the program, will result in significantly less demand for landfill space. This in turn will accrue environmental benefits in terms of less stress on the air, surface and ground water, and land, with fewer future conflicts over land use.
- 5.18 There are numerous environmental advantages to implementing a national composting program. Paramount among these are the direct benefits for the soil conditions in Barbados which include erosion control, improved soil structure, increases in micro-nutrient levels, and increases in the organic levels of the soil. Additional landfill life from the diversion of organic wastes is another benefit.

E. Issues and risks

- 5.19 The proper operation of the Greenland landfill is essential to the success of the project. The landfill's location within the boundaries of a proposed National Park would make any environmental problems arising from the mismanagement of the landfill all the more severe. The Sanitation Service Authority's management of the Mangrove Pond landfill in the past has been less than satisfactory. Because the Greenland landfill would require an even higher level of expertise and technical capacity for successful management, there is a need for private sector involvement, to ensure operation at the highest standards.
- 5.20 There is a risk in not finding a suitable private sector operator with the recognized expertise and capability to carry out this task. To minimize the risk an international consulting firm has been hired to assist the Government of Barbados to prepare tender and bidding documents and help during the process of contracting the operator.
- 5.21 There may be a strong negative public reaction to the project if it results in significant environmental degradation or disturbance. This assumption is supported by the strong public reaction against the Mangrove Pond landfill when it was operated poorly, and by the fact that the Greenland landfill site has already attracted attention from environmental NGO's.

BARBADOS SOLID WASTE MANAGEMENT PROGRAM
Logical Framework

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumptions
<p><i>Goal:</i></p> <p>1. Improved environmental conditions, especially with regards to improving public health and preserving Barbados' attractiveness to tourists.</p>			<p>1. Correlation between proper waste management and public health</p> <p>2. Tourists numbers are influenced by environmental situation.</p>
<p><i>Components:</i></p> <p>1. Final disposal facilities</p> <p>2. Environmental education</p> <p>3. Institutional strengthening</p>			
<p><i>Purpose:</i></p> <p>1. Safe and efficient disposal of solid waste</p>	<p>1.1 Compaction of 750 kg/m³ is obtained at the Greenland landfill.</p> <p>1.2 Odors not detectable from landfill- transfer station - compost facility.</p> <p>1.3 Compost quality meets or exceeds standards set in feasibility studies</p> <p>1.4 No increase in baseline contaminant concentration. in downstream monitoring stations.</p> <p>1.5 Limited visual & other impacts on proposed Scotland District National Park</p> <p>1.6 Closure of Mangrove Pond landfill</p>	<p>1.1 Data received from landfill.</p> <p>1.2 No reports (negative) from residents in the district</p> <p>1.3 Data from customer surveys.</p> <p>1.4 Data from monitoring program.</p> <p>1.5 Data from tourist surveys, consultation with nearby residents, direct observation</p> <p>1.6 Closure report</p>	<p>1. Other environmental factors remain constant or improve</p> <p>2. No significant changes in Barbados' waste management needs</p>

BARBADOS SOLID WASTE MANAGEMENT PROGRAM
Logical Framework

2. Waste minimization is achieved and reduction of illegal dumping.	<p>2.1 Quantity of per capita waste generated reduced from 0.9 kg/day to 0.7 kg/day by 2005</p> <p>2.2 > 75% favorable response in annual consumer satisfaction surveys.</p> <p>2.3 Tourist complaints about street side litter reduced by 50%.</p> <p>2.4 number of illegal dumping sites reduce in 50% by the year 2000.</p>	<p>2.1 Data received from landfill, transfer station , composting facility and bulky waste landfill.</p> <p>2.2 Results of test received, consultation with nearby residents.</p> <p>2.3 Data from tourist surveys & questionnaires.</p> <p>2.4 Environmental audits.</p>	<p>Changes in public attitudes and actions</p> <p>demand for recyclable grows.</p>
3. Institutions are strengthen.	<p>3.1 90% compliance with collection schedule (once/twice/week).</p> <p>3.2 Complete and accurate environmental monitoring data collection.</p> <p>3.3 Accurate financial statements.</p> <p>3.4 number of trained staff.</p>	<p>3.1 Data from survey questionnaires.</p> <p>3.2 Environmental reports.</p> <p>3.3 Annual financial reports.</p> <p>3.4 Records from professional development.</p>	<p>MOHE supports the development of EED and the new WMC.</p>
<p><i>Outputs:</i></p> <p>1. Physical facilities built and in operation.</p> <p>Private sector participation programme implemented.</p>	<p>1.1 Stages 1&2 of landfill built and in operation. Built by Aug. 1997 to specs.</p> <p>1.2 Transfer station and composting facility built and in operation. Built by July. 1999 to specs.</p> <p>1.3 Bulky waste site built and in operation by Dec. 1998.</p> <p>1.4 Hazardous waste disposal activities are implemented by Oct. 31, 1999.</p>	<p>1.1 Direct observation & inspection of facilities.</p> <p>1.2 Direct observation & inspection of facilities.</p> <p>1.3 Direct observation & inspection of facilities.</p> <p>1.4 Direct observation & inspection of facilities.</p>	<p>(Output to purpose)</p> <p>1. Facilities well operated & maintained.</p> <p>2. Legislation is enforced.</p> <p>3. Market for compost and recyclables.</p> <p>4. Increased efficiency and effectiveness due to private sector involvement.</p>

BARBADOS SOLID WASTE MANAGEMENT PROGRAM
Logical Framework

	1.5 Private sector operator is contracted by January 1999.	1.5 Signed contract.	5. Estimated waste generation rates are accurate.
	1.6 Bulky waste facility operated by private sector by July. 1999	1.6 Signed contract.	6. Roads are updated and maintained.
2. Education/awareness program implemented	2.1 Environmental education unit established by January 1999.	2.1 Staff restructuring approved.	7. Change in public's attitude and actions.
	2.2 Waste management education strategy report by January 1999.	2.2 report.	
	2.3 Promos on T.V., radio, newspapers by June 1999.	2.3 Direct observation, newspaper copies.	
	2.4 Communal depots in operation.	2.4 Direct observation and report.	
3. SSA and EED restructured	3.1 New SSA & EED structure in place by Dec. 1998.	3.1 cabinet and MOHE official notice.	
Routing study and implementation completed			
Cost recovery study completed	3.2 Vehicles collecting refuse on new routing system by June 1999.	3.2 residential surveys.	
	3.3 Plan of action for revised tipping fees and environmental levy.	3.3 Report with action plan approved.	

BARBADOS SOLID WASTE MANAGEMENT PROGRAM
Logical Framework

<i>Activities:</i>	BUDGET	ANNUAL REPORTS	(Activity to Output)
1.1 Build solid waste facilities. 1.2 Hire private contractor. 1.3 Hire contractors. 1.4 Conduct operational assistance program. 1.5 Hire consultants 1.6 Acquire land. 1.7 Secure financing. 1.8 Procure operational equipment. 2.1 Implement environmental education program. Contact media campaign 2.2 implement waste minimization activities procure goods 3.1 Conduct and implement recommendations of institutional strengthening study. 3.2 Conduct routing study 3.3 Conduct cost recovery study.			1. Designs are feasible/ 'buildable'. 2. Objections by public/ individuals handled. 3. Climate conditions are favorable. 4. Industrial relations are favorable. 5. Private sector interest. 6. Other proposals rejected if not compatible. 7. Posts created and filled. 8. IDB/CDB will approve loans. 9. Recommendations accepted by politicians. 10. Timely action by other Government Ministries (Legal Affairs, Housing & Lands, Civil Service)

**BARBADOS SOLID WASTE MANAGEMENT PROGRAM
BIDDING SCHEDULE
TENTATIVE PROCUREMENT PLAN**

PRINCIPAL PROCUREMENT	FINANCING BANK %	METHOD	PREQUALIF.	Amount (US\$000s)	Publication date (half of year)
A. Items					
1. Monitoring equipment	100	ICB	NO	400.0	98/I
2. Computers	100	ICB	NO	100.0	98/I
3. Containment depots (5 lots)	100	LB	NO	500.0	98/II
B. Consulting					
1. Engineering supervision (firm)	80	ICB	YES	1,150.0	96/II
2. Collection and containment study	100	ICP	NO	150.0	98/I
3. Cost recovery study	100	ICP	NO	100.0	99/I
4. Environmental education (20 lots)	100	LB	NO	500.0	98/I
5. Institutional strengthening (training)	100	ICP	NO	250.0	98/I
C. Works and improvements					
1. Greenland landfill	25	ICB	YES	10,500.0	96/II
2. Transfer station - compost facility	100	ICB	YES	6,100.0	97/II
3. Bulky waste	0	LCP	NO	310.0	98/I
4. Road Rehabilitation	100	LCP	YES	1,050.0	98/I

ICP - International calls for proposals
ICB - International competitive bidding
LB ^{1/} - Local bidding
LCP - Local call for proposals

^{1/} Local bidding regulations

- under US\$10,000, contracts may be awarded without tenders.
- over US\$10,000 and less than US\$50,000, contracts may be awarded without tenders, but written quotation shall be obtained.
- over US\$50,000, tenders must be invited in the local press.

PROPOSED RESOLUTION

BARBADOS. LOAN ____/OC-BA TO THE GOVERNMENT OF BARBADOS
(SOLID WASTE MANAGEMENT PROGRAM)

The Board of Executive Directors

RESOLVES:

That the President of the Bank, or such representative as he shall designate, is authorized, in the name and on behalf of the Bank, to enter into such contract or contracts as may be necessary with the Government of Barbados, as Borrower, for the purpose of granting it a financing to cooperate in the execution of a Solid Waste Management Program. Such financing will be for the amount of up to thirteen million dollars of the United States of America (US\$13,000,000) from the Single Currency Facility of the Ordinary Capital Resources of the Bank, and will be subject to the "Special Contractual Conditions" and the "Terms and Financial Conditions" of the Executive Summary of the Loan Proposal.