GOJ/ IDB Project ATN/ SF-8164-JA

FINAL REPORT
KINGSTON HARBOUR
INSTITUTIONAL STRENGTHENING PROJECT





Kingston Harbour

"BRING BACK THE LIFE!"

F I N A L R E P O R T *of the* **Kingston Harbour Project Unit**

C O N T E N T S

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List of Abbreviations

GOJ	Government of Jamaica
NEPA	National Environment and Planning Agency
USAID/EAST	United States Agency of International Development/Environmental Audits for Sustainable Tourism
KMA	Kingston Metropolitan Area
MAJ	Maritime Authority of Jamaica
MARPOL	International Convention for the Prevention of Pollution from Ships
IDB	Inter-American Development Bank
MLE	Ministry of Land & Environment
KHPC	Kingston Harbour Project Committee
KHPU	Kingston Harbour Project Unit
NRCA	Natural Resources Conservation Authority
TPD	Town Planning Department
LDUC	Land Development Utilization Commission
PIOJ	Planning Institute of Jamaica
KHC	Kingston Harbour Corporation
SWIL	Smith Warner International Ltd

F I N A L R E P O R T *of the* Kingston Harbour Project Unit

1. INTRODUCTION -The main SOURCES and CAUSES of Kgn. Harbour Pollution.

1.1 Kingston Harbour is located on the southeastern coast of Jamaica and encompasses about 26 sq. km of navigable water with depths of up to 18 m. The harbour is formed by the Palisadoes peninsula, (See Fig.1), which extends a distance of around eight miles due westwards from the Harbour View round-about, with the historical township of Port Royal located at the very western tip of the peninsula. Apart from providing the only road route all the way out to Port Royal, the Palisadoes, with the Norman Manley Highway running along the first half of its length, also provides the only means of road access to several other vital national institutions located on the peninsula, such as the Norman Manley International Airport, Ministry of Agriculture Plumb Point Quarantine Complex, Caribbean Maritime Institute, Royal Jamaica Yacht Club, Buccaneer Beach and Gunboat Beach.

Over the past several decades, the port of Kingston has been developing into a leading regional transshipment center serving the Caribbean and Central America.

Figure1 Aerial Photo Showing General Layout of the Project Area

1.2 Scientific studies indicate that the Palisadoes peninsula consists mainly of terrigenous sediments originating from the rivers to the east of Harbour View, transported down by longshore drift along the coast and deposited amongst a number of derelict cays aligned westwards from Harbour Head out to Port Royal. Because of the nature of the geomorphological processes by which the structure is believed to have been formed, in the technical literature marine geologists refer to the Palisadoes Peninsula as a *tombolo*. (See Fig.2)

Figure 2: Kingston Harbour in the Early 18th Century.
Note indications of many discontinuities in the structure of the tombolo.

1.3 Over the past three decades, pollution of Kingston Harbour has been developing into a very serious problem for the Jamaican Authorities, as a number of studies have identified increasing levels of bacterial contamination, decreasing levels of dissolved oxygen, declining species diversity, high nitrate concentrations, increase in the frequency of algal blooms, decreases in shrimp and fish populations, and elevated concentrations of metals and pesticide levels in fish.

1.4 Water quality in the harbour has been deteriorating as a result of inflows of the following main categories of pollutants: (1) untreated sewage, (2) Industrial discharges, (3) ship wastes, and (4) agricultural runoff.

Fig.3 below shows the locations of all the major rivers, gullies and wastewater outfall pipes which discharge into Kingston Harbour.

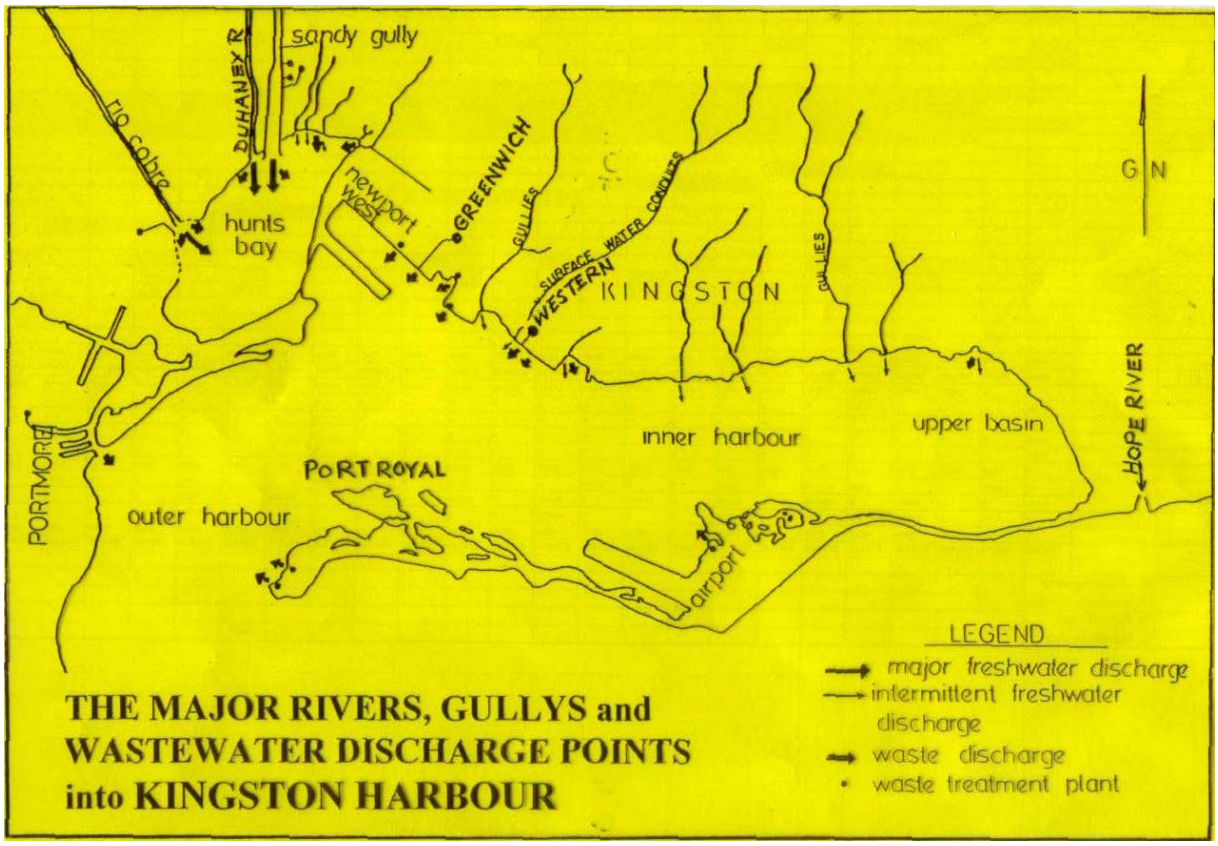


Fig.3 –Locations of all Rivers, Gullies & Outfall Pipes Discharging into Kgn. Harbour

1.5 In 2003, when this project was in the final stages of formulation, the issue of untreated sewage (which is by far the most serious source of all of the pollution of the Harbour) was being addressed through IDB's Water and Sanitation Project (JA-0114), which included support for construction of new wastewater treatment facilities for the Kingston Metropolitan Area (KMA). Therefore it was not envisaged that this project would need to give any concerted attention to abatement of sewage pollution.

1.5.1 Actually, in February 2006, the Prime Minister officially broke ground for construction of an 18.5 mgd wastewater treatment facility, the first phase of the Soapberry Wastewater Treatment Plant, which is expected to be completed in two years time, (See Appendix B). This first module at Soapberry will provide capacity to deal only with the effluent from roughly one-third of the entire KMA, which is the extent that is currently sewered. There are large, densely populated areas of the KMA that drain into the harbour which are currently un-sewered, and are served by malfunctioning treatment plants which discharge inadequately treated effluent into nearby gullies, thereby adding to the volume of pollutants which eventually reach down into the harbour.Therefore, it would be somewhat misleading if an impression were to be given that the problem of sewage pollution of the

harbour will be entirely eliminated upon completion of this Soapberry Phase 1 project. In fact the Master Plan for Soapberry calls for future construction of two other modules to bring the total treatment capacity up to around 60mgd.

1.6 The Rio Cobre is the longest/largest watercourse which discharges into Kingston Harbour, and is the main source of pollution from agricultural run-off. However, Problems stemming from agricultural run-off were outside of the scope of this project, though some of the activities which were chiefly planned to strengthen NEPA's capacity would also encompass monitoring of pesticide levels.

1.7 Industrial discharges and ship wastes were the two pollution sources which were to be given specific attention under this project

1.8 Past studies of the prevailing legislative and institutional framework have reinforced the view that duplications of powers of intervention, and inadequacies of legislation, tend to hinder environmental pollution monitoring and enforcement. Even though the NRCA Act provides the framework for addressing the pollution problems of Jamaica, some crucial Regulations remain to be enacted, and in the meantime enforcement is somewhat weak and limited.

1.9 With establishment of the National Environment and Planning Agency, (NEPA), in April 1, 2001, the Government of Jamaica (GOJ) sought to integrate the country's environmental and planning functions with the responsibilities for formulation of sustainable development policies and programmes, combining them into a single entity, and locating them in one place. The resulting institution, NEPA, is an agency of the Ministry of Land and Environment, representing a merger between the Natural Resources Conservation Authority (NRCA), the Town Planning Department (TPD) and the Land Development and Utilization Commission (LDUC).

1.10 In 2002, the Planning Institute of Jamaica (PIOJ) on behalf of GOJ, requested IDB to provide US$500,000 from the Fund of Special Operations, to finance a Technical Cooperation project –one of the main outputs of which would be the development of an institutional management entity which would be best suited to effectively manage the rehabilitation and sustainable use of the harbour. The total cost of the project was expected to be around US$620,000 with GOJ contribution to the value of around US $120,000 provided by NEPA, the Executing Agency, on behalf of Ministry of Land and the Environment.

2. THE PURPOSE and OBJECTIVES OF THE PROJECT

2.1 The purpose of this project is mainly to address institutional strengthening for enhancement of the environmental management of Kingston Harbour; an initiative which can be considered as being equivalent to taking the initial steps of a journey that is likely to be challenging, but one that must be undertaken with determination and steadfastness, in order to accomplish the goal of rehabilitating and protecting an invaluable national asset.

2.2 The project had two main objectives:

(i). To develop an institutional model that will be able to effectively manage and coordinate the diverse stakeholders' activities which impact upon the environmental condition of Kingston Harbour; and

(ii). support pre-investment efforts to address major pollutant sources.

2.2.1 In regard to (i) above, this objective arose out of the situation where, over the past several decades, Jamaican Authorities have been making sporadic efforts to deal with the environmental problems of Kingston Harbour; but these efforts have had limited success in abating the pollution, in part due to lack of clarity regarding responsibility and accountability for regulatory actions, and duplication of efforts due to poor or non-existent coordination amongst Agencies. The present heightened concern of government in relation to the fate of Kingston Harbour arises out of the realization that, unless urgent action is taken to address the long-standing problems, the continuing decline of the environmental condition of the harbour and the overall cost of rehabilitation, could soon reach irreversible levels.

2.2.2 In regard to (ii) above, sewage and agricultural run-off were not to be given any special attention under this project. (They were being dealt with under separate arrangements). Two pollution sources were to be given special attention under this project, viz: *industrial effluents* and *ship wastes*.

3. THE STRUCTURE OF THE PROJECT

The project consisted of the following four major components A, B, C and D; and the vast majority of the funds provided have been used to pay Consultants for performing the work required to fulfill the Terms of Reference described below:

3.1 **COMPONENT A** -*Institutional Strengthening and Preparation of a Zoning and Physical Development Master Plan*

This component called for development of a short-list of institutional options for the GOJ to choose from and implement by dedicating resources, assigning responsibilities, and setting objectives. The options will be informed from studies of successful international cases of harbour remediation. An implementation plan is to be formulated which will include the steps and milestones required by key GOJ and other participants towards effective self-organization. Component A also involved development of two fundamental tools that are requisite to a national initiative to rehabilitate Kingston Harbour: (a) a Basic Zoning Plan of the Harbour, and (b) a Water Quality Model. The Basic Zoning Plan will serve as a complement to, and will be framed within, the Master Plan of KMA. Given the limited budget available for this task, the Basic Zoning Plan will focus specifically on the problem of water quality of the Harbour, proposing general land and water uses on and around Kingston Harbour. The Water Quality Model will be used primarily by NEPA to provide an empirical basis for remediation activities, allowing NEPA to prioritize enforcement efforts internally as well as publicly.

3.2 **COMPONENT B** -*Assistance to Industries to Improve Their Operations so as to Reduce/Eliminate Harmful Discharges to the Harbour.*

The various activities of this component will serve to strengthen NEPA's capacity to provide technical assistance to industry and to enforce environmental regulations more effectively. This component complements the activities of the Component for the Development of a Physical Plan for Kingston Harbour, in that it will link Water Quality Model results with specific intervention activities. The four basic activities within this component include developing a NEPA program strategy for addressing industrial polluters, conducting sample pollution prevention audits at one facility (leveraging USAID/EAST project experiences), leading biggest polluters through stages of improved environmental management, and developing a revolving fund to help finance performance improvements within the community of industrial enterprises located in the KMA. The consultants will explore opportunities for financing the fund with assistance from both local and international sources.

3.3 **COMPONENT C** - *Preparation of Bid Documents for Provision of Ship Waste Reception Facilities for the Port of Kingston.*

The purpose of this component is to prepare the documentation required to call for bids to finance, build and operate the proposed Waste Reception Facility. The Facility would help reduce pollution loads discharged to Kingston Harbour. While NEPA is the executing agency for this grant, the Maritime Authority of Jamaica (MAJ) will provide assistance in preparing the tender documentation. Consultants should draft the document for financing, building and operating structure as well as prepare the financial model and tender documents. The proposed facility would also allow Jamaica to fulfill its obligation as a member of the International Maritime Organization's International Convention on the Prevention of Pollution from Ships (1973) and its Protocol of 1978 (MARPOL).This work will be guided by two criteria: 1) the options explored in the resulting document should meet the needs expressed by the GOJ sponsors, and 2) the options must be structured to attract investors to bid for providing the required facilities.

3.4 **COMPONENT D** - *Public Outreach, Education and Training.*

This component consisted mainly of two activities designed to build awareness amongst the general public as well as stakeholders and polluters in the Kingston Harbour Area: (a) a stakeholder awareness campaign, and (b) development of education modules for primary and secondary school children in the Kingston Area. NEPA would coordinate with the Ministry of Education, Youth and Culture in the development and delivery of the education modules. This component will support the development of two sets of educational modules for schools in the Kingston Harbour area of influence, one for the primary school level and one for the secondary level. Modules will focus on building understanding among Kingston students of the ecology of Kingston Harbour, the importance of maintaining environmental quality of the Harbour, and specific actions students can take to build general public awareness and change behavior. The Consultant will help design permanent displays and tools that will have a lasting presence in the target schools in helping to build overall awareness.

4 THE MANAGEMENT FRAMEWORK FOR EXECUTION OF THE PROJECT

4.1 The Technical Cooperation Agreement between IDB and GOJ for IDB support for this project was signed July 8th, 2003. The IDB Resident Representative signed for IDB, and the CEO of NEPA signed on behalf of GOJ. The Agreement named NEPA as the Executing Agency, on behalf of the Ministry of Land and Environment. The management framework for execution of the project is depicted in the organigram shown in Fig.4 below.

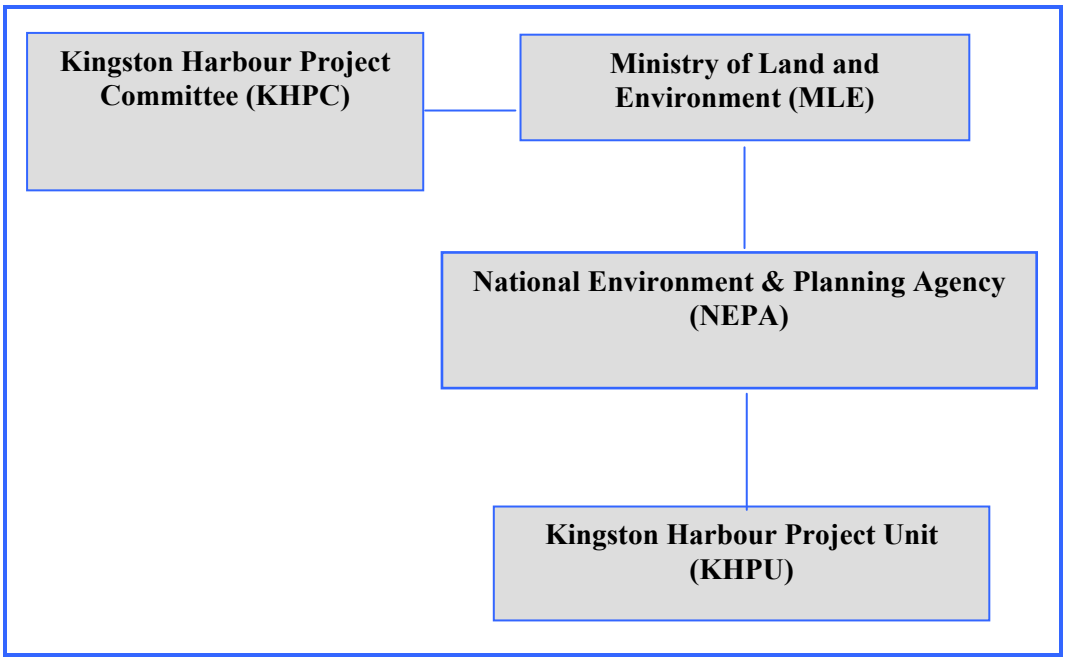


Figure 4 – The Management Framework for Execution of the Project

4.2 The Kingston Harbour Project Committee, (KHPC)

4.2.1 NEPA invited around 25 public and private sector organizations, including some CBO's and NGO's which were known to have interest in Kingston Harbour, to become members of the KHPC, and participate in management of the execution of the project. Twenty respondents accepted NEPA's invitation, and nominated representatives, who attended meetings with varying consistency.

A complete list of members of the KHPC is included at Appendix A.

4.2.2 On behalf of MLE, the KHPC was responsible for general oversight and the overall direction and monitoring of the project. During the course of the project, the KHPC convened formally at NEPA on fifteen separate occasions. These meetings were chaired by NEPA's Director of the SPPP Division. The KHPC also met twice at MLE's Half-Way-Tree Rd. offices, and on these occasions the meetings were chaired by the Permanent Secretary of the MLE. Formal minutes recording the proceedings of each of the above-mentioned KHPC meetings are available from the project files kept at NEPA.

4.3 The Kingston Harbour Project Unit, (KHPU)

4.3.1 The KPHU, comprised of two persons –*Project Coordinator* and *Assistant Project Coordinator,* was accommodated at the NEPA head office, 10 Caledonia Avenue. In all respects, especially logistically, this situation proved to be most favourable, since it facilitated effective access and communication between the KHPU and some key resource persons located in various NEPA branches such as Coastal Zone, Pollution Control, Planning and Accounts.

4.3.2 Basically, the KHPU functioned as the secretariat for the KHPC, directly responsible for the day-to-day execution of the project. Specifically, the KHPU:

- prepared Terms of Reference for the various project components;
- carried out appropriate procurement processes for all required goods and services;
- interfaced with IDB Specialists, National Contracts Commission, and all relevant government Ministries and Agencies, and prepared Work Plans, Budgets and Reports, as required by Competent Authorities;
- prepared contract documents and monitored and supervised performance of all Contracts;
-

5. PROCUREMENT of GOODS AND SERVICES

5.1 All pertinent information concerning execution of the procurement processes for the consulting services required for performance of each of the four project components can be found in the respective *"Final Report on the Procurement of Consulting Services for Component…",* which were submitted by NEPA to IDB.

5.2 All procurement of goods and services for this project was carried out in accordance with the Project Agreement and in compliance with the rules and guidelines of the following IDB documents:

- *Prequalification Documents for Procurement of Consulting Services;*
- *User's Guide for the Prequalification Documents for Procurement of Consulting Services.*

Published by: Procurement Policy and Coordination Office

Inter-American Development Bank

1300 New York Avenue, NW

Washington, DC 20577

The policy of the Government of Jamaica in regard to Public Sector Procurement is set out in the

- *Handbook of Public Sector Procurement Procedures*

published by: National contracts Commission

17 Knutsford Boulevard

Kingston 5, JAMAICA

The GOJ rules and guidelines were also strictly adhered to by the Project Unit throughout all the procurement processes for the project.

5.3 The GOJ's Procurement Guidelines require that all contracts for procurement of goods and services exceeding four million Jamaica dollars in value should be submitted to the National Contracts Commission for approval. The values of the contracts for components A, B, and C were each in excess of J$4 million, therefore these all had to be submitted for NCC approval. The value of component D was less than J$4 M, and therefore the contract for this component Public Education & Outreach), did not have to pass through the NCC, step (x) in the sequence given below.

5.4 The actual procurement process for each team of consultants was carried out by the Project Unit in sequential steps, as follows:

(i). Final drafting of TORs

(ii). Obtain KHPC approval of TORs

(iii). Obtain IDB "no objection" to the TORs and Advertisements

(iv). Advertise and Issue Request for Proposals (RFPs)

(v). Evaluate proposals

(vi). Prepare draft contract for engagement of selected consultant

(vii). Obtain KHPC approval of contract for selected consultant

(viii). Obtain IDB "no objection" to contract for selected consultant

(ix). Obtain MLE's approval of selected consultant

(x). Obtain NCC's approval of selected consultant

(xi). Signing of contract between NEPA and selected consultant.

5.5 Table 1 below gives a summary of the references and dates of the approval letters pertaining to steps (viii), (ix), & (x) in the procurement processes for engagement of consultants for each of the four project components.

Table 1 – Summary of Approval Dates in the Procurement Processes

	Project Component A Institutional Strengthening	**Project Component B** Assistance to Industries	**Project Component C** Ship Waste Facility	**Project Component D** Public Outreach
CONSULTANTS	Smith Warner International	Claude Davis & Associates	KPMG Peat-Marwick & Partners	AV Plus Ltd
IDB'S NO-OBJECTION LETTER	COF/CJA/652/2004 April 8, 2004	COF/CJA/709/2004 April 20, 2004	COF/CJA/1104/2004 June 21, 2004	COF/CJA/1038/2004 June 9, 2004
MLE's Approval Letter	March 19, 2004	April 29, 2004	April 26, 2004	Not Applicable
NATIONAL CONTRACTS COMMISSION APPROVAL LETTER	22-012 May5, 2004	22-012 May 13, 2004	22-012 July 19, 2004	Not Applicable
CONTRACT PRICE	US$ 173,940.00	US$111,150.00	US$73,225.00	US$59,988.00
FINAL PRICE	US$187,369.80	US$111,150.00	US$73,225.00	US$59,988.00

Table 2 –Comprehensive List of All the Outputs of the Project

	OUTPUTS OF THE CONSULTANTS
Date Received	**COMPONENT A – INSTITUTIONAL STRENGTHENING**
June '04	Literature Review Report
January '05	Harbour Remediation Experiences Report
January '05	Water Quality Model Selection Report
February '05	Institutional Arrangement Report (*First Draft*)
July '05	Institutional Arrangement Report (*Second Draft*)
November '05	Institutional Arrangement Report (*Third Draft*)
November '05	Hydrodynamic and Water Quality Model Setup
November '05	Water Quality Communication Protocol
November '05	Zone of Siting Feasibility
December '05	Institutional Arrangement Report – APPENDICES
December '05	Institutional Arrangement Report (*FINAL*)
December '05	Kingston Harbour Zoning Strategies & Action Plan (*FINAL*)
	COMPONENT B – ASSISTANCE TO INDUSTRIES
October '04	Identification & Characterization of Industries and Strategies for Enforcing Environmental Discharge Limits for Industrial Polluters
January '05	Cleaner Production/EMS Audits for Two Industrial Facilities
May '05	Assistance to the Most Serious Polluters to Improve Environmental Management
July '05	Develop and/or Leverage Existing Revolving Funds to Help Finance Process Improvements and Environmental Performance Improvements of Kingston Industries
November '05	Model Forms of Application to Facilitate/Encourage Existing Industries to Seek Access to Current EU/JAMPRO Grant Funds
	COMPONENT C – SHIP WASTE FACILITIES FOR THE PORT OF KINGSTON
October '04	Siting Study for Ship Waste Reception Facilities (SWF) (*First Draft*)
November '04	Siting Study for Ship Waste Reception Facilities (*FINAL*)
December '04	Options for Ownership, Investment and Operation of SWF (*First Draft*)
February '05	Options for Ownership, Investment and Operation of SWF (*Second Draft*)
April '05	Options for Ownership, Investment and Operation of SWF (*Third Draft*)
May '05	Options for Ownership, Investment and Operation of SWF (*FINAL*)
July '05	Technical & Financial Models for SWF for Kingston (*First Draft*)
August '05	Technical & Financial Models for SWF for Kingston (*FINAL*)
December '05	Bid Documents for Ship Waste Reception Facility for the Port of Kingston
	COMPONENT D – PUBLIC EDUCATION AND OUTREACH CAMPAIGN
August '04	Outline of Educational Modules
September '04	Draft Plan for Public Awareness Campaign
November '04	Report on PR Activities for November 2005 Launch of the Public Awareness Campaign
December '04	Second Draft of Educational Modules
March '05	Physical Desktop Model of Kingston Harbour
March '05	Preliminary Drafts of Billboard and Poster Designs
March '05	Teachers' Manual Grades 1-6 **and** Grades 7-11
May '05	Final Designs for Posters and Newsletter
May'05	Final Designs for Brochure and Billboards
December '05	Comprehensive Report on all Activities of Public Awareness Programme

6. NOTEWORTHY ASPECTS OF COMPONENTS A, B & C

A comprehensive list of all the outputs of the project is given in Table 2 above. Comments on the more noteworthy aspects of the outputs of components A, B & C are given below:

6.1 COMPONENT A

6.1.1 Institutional Model for Enhanced Management of Kgn. Harbour

6.1.1.1 One of the main objectives of the project was to develop an institutional model that would be best able to effectively coordinate the diverse stakeholder activities that significantly affect the condition of the harbour. Development of the model was expected to be accomplished via performance of the following specific tasks:

- Review and assess international harbour clean-up case studies;
- In light of lessons learned from case studies, prepare an appropriate set of selection criteria and use these criteria to formulate a range of possible institutional arrangements and offer them for the consideration and comments of all stakeholders.
- Conduct consultative workshops to capture the views of all stakeholders; then fully elaborate a short-list of three options for the clean-up and development of Kingston harbour;
- Conduct further consultations to obtain the concurrence of the key stakeholders on selection of the most appropriate institutional model;
- Prepare an Implementation Plan for establishment of the selected institutional management framework.

6.1.1.2 In the process of formulating and agreeing on the structure of the model, the consultants had to proceed in a reiterative fashion in order to address the opinions and preferences of one or another of the interest groups that emerged from within the total membership of the KHPC, the entity charged with official responsibility (on behalf of MLE) for direction of the project. In the event, it took four separate consultations/workshops with stakeholder groups, and three rounds of revisions of proposed model formulations, to arrive at a final version of the institutional framework that was acceptable to the KHPC.

6.1.1.3 A copy of one of the consultants' most definitive presentations to the KHPC, (June 24th, 2005), concerning the development and selection of the best-suited management entity is included at Appendix C.

An Organization chart for the recommended Institutional model is shown in Fig.5 below.

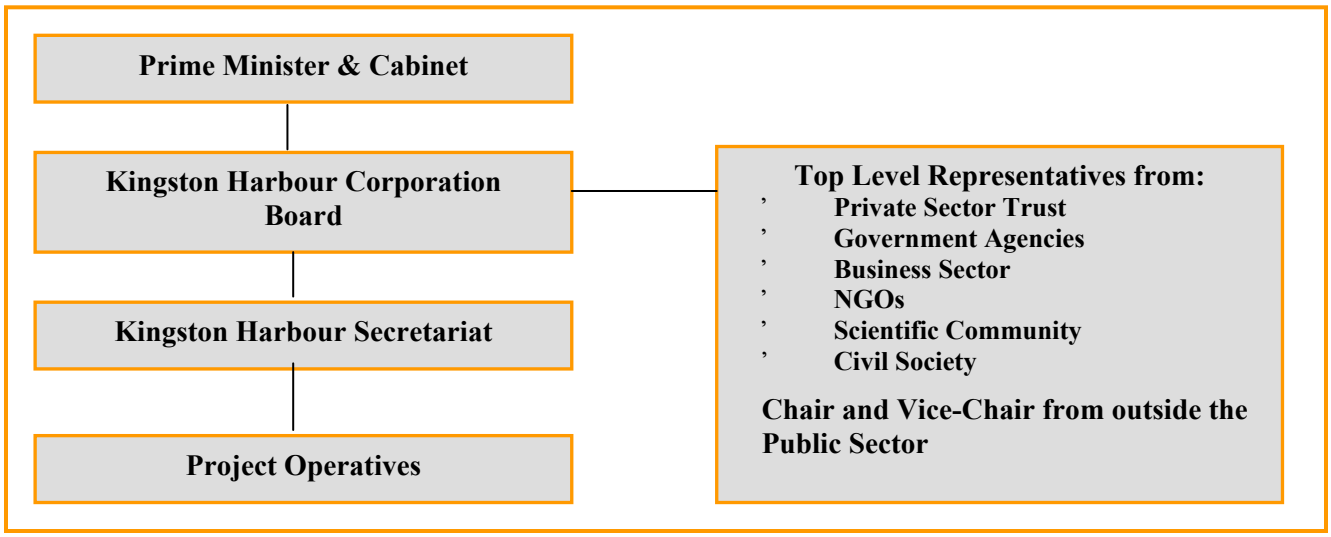


Figure 5 –The Recommended Institutional Model for Enhanced Management of Kgn Hrbr

6.1.1.4 The recommended model is comprised of the following key elements:

(Note: The italicized passages are direct quotations taken from SWIL's final report).

i). KINGSTON HARBOUR CORPORATION (KHC)

"...a statutorily empowered composite entity with public and private sector representation, dedicated to championing, overseeing and realizing the rehabilitation, conservation, management and development of Kingston Harbour and its precincts. It would involve private sector and project-driven inputs, in accordance with the vision, objectives and stipulations of a statutorily delineated and periodically revised Kingston Harbour Plan. The Plan would be developed with the participation of and would be binding on the various governmental and other entities affecting or interested in the harbour and its precincts.

The KHC would be established to sustain an integrated approach to the wide range of environmental, planning and developmental matters affected by the state of Kingston Harbour. The KHC would coordinate, seek funding for, and where appropriate, manage a wide range of projects and activities related to the rehabilitation and development of Kingston Harbour. This new KHC would play a catalytic role in the establishment of a private sector/civil society Trust ***(Kingston Harbour Trust),*** *towards rehabilitation of the harbour.*

The KHC would depart from the current arrangement (a non-composite governmental entity operating under the aegis of a single Minister). A majority of study participants were of the opinion that determination of the ultimate reporting arrangements should be left to the Prime Minister and Cabinet. However, to avoid pitfalls that have impeded progress towards harbour cleanup in the past, it would be important for the selected arrangement to assure the balanced engagement of the wide range of interested Ministries and Agencies.

ii). KINGSTON HARBOUR TRUST,(KHT)

The Trust would have representation on the KHC Board and be instrumental in garnering funding to complement that obtained by the new entity and in helping in other ways to attract private and public sector support.

The Trust could be established by way of a non-profit (tax exempt) company, limited by guarantee, involving the business sector, donor entities, environmentalists/scientists, community-based organizations, concerned citizens and other members of civil society; with a Board of Directors whose members possessed requisite fund-raising, accounting, marketing, public relations and legal expertise.

iii). KINGSTON HARBOUR SECRETARIAT,(KHS)

The Secretariat would include personnel with project-writing, funds-garnering and project management skills. It would carry out these functions as part of its management responsibilities. Upon establishment of the KHC, the Secretariat would oversee preparation of the ***Kingston Harbour Plan****. The Secretariat would also assist with setting up of the* ***Kingston Harbour Trust Fund****. Following upon adoption of the Plan, the Secretariat would provide day -to-day management of its implementation.*

6.1.2 **Water Quality Model (WQM)**

6.1.2.1 The consultants were required to:

i). Assist NEPA to identify, acquire and develop an appropriate water quality model for use in the rehabilitation and management of Kingston Harbour;

ii). Train selected NEPA staff members, and persons from some other interested institutions in the applications and operations of the model;

iii). Calibrate the model;

iv). Prepare a protocol for communicating water quality information to other Authorities and to the general public.

6.1.2.2 The activities of the consultants in fulfilling the above commitments are documented in their relevant reports, viz:

- *Water Quality Model Selection Report* (January,2005),
- *Hydrodynamic and Water Quality Model Setup*, (November, 2005),

  (Note: Some of the more technical exercises which were carried out during the setting-up and training process were actually demonstrated on computer screens, to the trainees, in classroom settings. In such instances, the consultants recorded the exercises on CD's, which they have supplied, along with the written report.
- *Water Quality communication Protocol* (November, 2005).

6.1.2.3 However, the consultants ended their work on this Deliverable by indicating that, due to lack of some essential data, there is a limitation in regard to the immediate functionality of the WQM. The following is a direct quotation from pg. 17 of their *Hydrodynamic and Water Quality Model Setup* report:

"In summary, the available data for calibration of the hydrodynamic model is quite limited and should be augmented with a data collection programme specifically designed to calibrate a 3D model."

6.1.2.4 In a subsequent section of this report the Project Unit will offer suggestions regarding a follow-on project for completion of the calibration of the WQM.

6.1.3 **Zoning and Physical Development Master Plan for the Harbour**

6.1.3.1 The conceptual master plan which the consultants have presented is based upon the following four main use and development concepts:

(1). High density, mixed residential and commercial waterfront development, accommodating a mix of incomes, maximizing visual and physical access to the harbour, and acting as a catalyst for further downtown and central area rehabilitation, renewal and intensification.

(2). A focus on expanding the revenue-generating core and support activities of the working harbour and waterfront, including port expansion, a ship-generated waste reception facility, an enlarged dry dock, cruise ship terminal, possibly also with home-porting facilities other water-related industries.

(3). Port and airport expansion, while ensuring wetlands restoration and creation, improved provisions for fishers, protection of heritage, and waterfront access.

(4). Improved waterfront access for new parks and beaches, trails and restoration and enrichment of aquatic recreation.

(N.B. the italicized passages above are direct quotations taken from SWIL's *Kingston Harbour Zoning Strategies & Action Plan*, Nov., 2005)

6.1.3.2 SWIL's conceptual master plan includes suggestions for many developmental "anchor" projects which they think would enhance the built environment, and contribute towards realization/fulfillment of the value of the harbour as a major national economic asset. Several of these anchor projects are ideas which have previously been expressed by others, and some have actually been developed to the pre-feasibility stage of the project cycle -e.g. Fort Augusta Free Zone, Port Royal Heritage/Cruise-ship Tourism, Gunboat/ Buccaneer Beach Development –but generally, the project proponents seem to be unable to mobilize the necessary capital to continue implementation. However, a "signature" project has been suggested, *Kingston Harbour Bridge*, which has generated considerable public interest, (See Appendix…); and, as will be seen later in this report, the Project Unit is of the view that NEPA should consider supporting this idea to the extent of actively seeking to identify and encourage potential investors/sponsors to undertake a serious pre-feasibility study for the bridge.

6.2 COMPONENT B

6.2.1 Strategies to Assist NEPA to Enforce Discharge Limits

The Terms of Reference of the Agreement between Claude Davis & Associates and NEPA called for the consultants to produce, as their first Deliverable, a report covering the following two specific tasks:

(i). Identification and characterization of the industrial facilities that discharge trade effluent directly or indirectly into Kingston Harbour;

(ii). formulation of strategies to assist NEPA to enforce limiting standards for allowable discharge of trade effluents.

These two obligations were satisfactorily fulfilled in the consultants' B1 report.

6.2.1.1 In regard to task (i), the' initial survey covered a total of 125 premises at which activities were taking place which might potentially generate types and volumes of effluent that could significantly affect Kingston Harbour. Further consideration of water consumption data for each of the premises led the consultants to eliminate 70 of the properties from the list,(their water consumption patterns were deemed to be below the level of significance –i.e. the level at which operators would be required to apply to NEPA for a license to discharge), leaving a total of 55 industries located in the parishes of Kingston, St. Andrew and St. Catherine whose discharges could affect the environmental condition of the harbour –either directly or indirectly.

The geographic distribution of the significant industries in relation to Kingston Harbour is shown in Fig.6 below, and a breakdown of their numbers by parish is given in Table 3 hereunder:

Figure 6: Geographic Distribution of Significant Industries

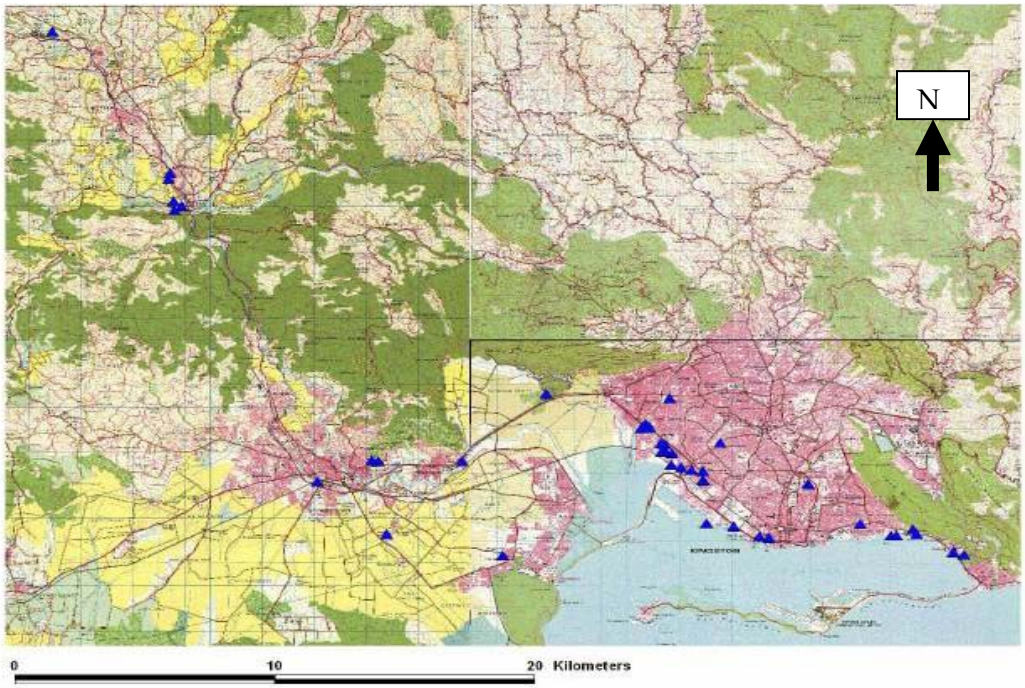


Table 3: Significant Industries by Parish

Location	Count
Kingston & St. Andrew – West (Spanish Town Rd, Downtown, Washington Blvd, Hagley Park Rd, Arnold Rd)	31
Kingston & St. Andrew – East (Windward Road/Rockfort)	7
St. Catherine - South (Spanish Town & vicinity)	11
St. Catherine – North (Bog Walk/Ewarton)	6
Total	55

6.2.1.2 Davis and Associates have suggested a number of strategies, viz: (a) to (f) below, to improve NEPA's ability to enforce discharge limits:

(a). Risk-based Strategy for Investigation, Inspection and Enforcement

- a risk assessment approach that identifies hazards and understands their likelihood and consequences; also,
- a systematic method of setting priorities for allocating scarce resources for investigations, inspections and enforcement of trade effluent and other pollution-related issues.

Assessment of the inherent risk of environmental damage and danger to human health posed by a particular industry could be based, in the first instance, upon the size of the discharge fee imposed, since the fee would have been calculated based upon the relative severity of impact (toxicity) from the pollutants generated.

(b). Outreach and Sector-Based Training.

In view of the on-going delay in enactment of Air Quality and Sewage and Sludge Regulations, and limited application of the existing Section 17 provisions for post-permit enforcement, it appears that industry has become somewhat dubious in regard to the seriousness of intent of the Authorities, and is currently "holding back" and adopting a "wait and see" attitude towards the potential consequences of non-compliance.

MLE/NEPA should strive to strengthen/deepen partnerships with key private sector organizations such as PSOJ, JMA, and the Business Council on the Environment (BCE).

Training modules should be prepared to be used for delivering sector-specific training to personnel engaged in licensed production in the various industrial sectors. Such training material should address how to comply with applicable Regulations, and how to implement clean production. Also, the modules should emphasize the fact that pollution prevention activities will reduce pollutant loadings, and that reduced loadings will translate into reduction of discharge fees.

(c). Sampling and Monitoring Programme for Trade Effluent

A programme of regular sampling and monitoring of trade effluent discharges to the harbour should be designed and implemented. Such programme should best be designed to fit within a comprehensive national programme for coastal water quality monitoring. Current documentation of NEPA's overall monitoring programme is limited to that which is included in the Agency's Corporate Plan. It is recommended that a detailed programme be developed and fully documented.

(d). Continued Promotion of EMS for Industries

Strategies for promotion of EMS were presented in a Draft White Paper prepared by NEPA in September 2002. Further promotion of EMS amongst the enterprises which discharge to the harbour should entail renewed targeting of members of the JMA; and encouraging those businesses which may have been audited, and have implemented EMS, to document their experiences and publish case studies.

(e). Incentive Schemes to Complement Regulatory Enforcement

The draft Sewage and Trade Effluent Regulations which are currently awaiting enactment already contain a number of incentives. The following are several additional incentives proposed by the consultants:

- National Awards for producers whose environmental performance surpass the national environmental standards,
- Establishment of an Environmental Neighbours Partners scheme which recognizes facilities or companies that implement local environmental projects in partnership with neighboring communities. The goal is to encourage communication between industrial facilities and adjacent communities.
- Identification of attractive, accessible, favourable sources of funding.

(f). Encouragement of Publication of Inspirational Case Studies

NEPA should encourage documentation and publication of cases of successful implementation of EMS. NEPA could establish a website devoted to pollution prevention, compliance assurance and enforcement information.

6.2.2 **Environmental Audits and Other Assistance to Selected Industries.**

6.2.2.1 For their Deliverables B2 and B3, Claude Davis and Associates were required to go out into the field and visit and interact with the operators of several selected industrial enterprises with a view to informing, assisting and generally motivating them towards achieving clean production. The overall objective was to focus on these firms and treat them as models for effecting improved industrial environmental performance through a combination of cleaner production measures and adoption of Environmental Management Systems, (EMS).

6.2.2.2 The following criteria were used for selection of the subject facilities:

(a). Facilities which discharge trade effluent either directly or indirectly (via rivers, gullies or underground aquifers) into Kingston Harbour;

(b). Facilities which discharge volumes of trade effluent in excess of 4 million litres per year, (1,056,800 US gallons/year);

(Note: four million litres/year is the threshold volume above which industrial facilities are legally required to obtain operating license from NEPA)

(c). Facilities with wastewater streams that are treatable by conventional technologies, whose operators are willing to cooperate and participate as models for other facilities

6.2.2.3 Based on the above criteria, a total of five firms were selected :

(1). Berger Paints Jamaica Ltd., manufacturers of paints, varnishes, printing ink, mastics. Located on the northwestern rim of the harbour.

(2). Caribbean Products Company Ltd., manufacturers of soaps and detergents, cleaning and polishing preparations, perfumes and toilet preparations; located on the north western rim of the harbour;

(3). J Wray and Nephew Ltd., distillers, rectifiers and blenders of spirits, and producers of ethyl alcohol from fermented materials. Located in Kingston, approximately half a mile onshore from the north-western rim of the harbour;

(4). Spike Industries Ltd., manufacturers of food products and beverages.

Located on Windward Rd., Kingston, on the northeastern rim of the harbour.

(5). Trade Winds Citrus Ltd., manufacturers of juices and other food products. Located in Bog Walk, St. Catherine, on the banks of the Rio Cobre, over twenty miles upstream of the river.

6.2.2.4 As there are no street sewers into which they can connect, all of the above firms discharge their trade effluent directly into waterways which empty out into the harbour, thereby contributing significantly to the degradation of the water quality.

6.2.2.5 For fulfillment of Deliverables B2 and B3 the consultants carried out the following specific tasks in relation to the above facilities:

- Initial Environmental Review (IER);
- Initial screening of different trade effluent treatment options;
- Identification of opportunities for cost savings, process efficiency improvements, waste reduction, and indications of the costs likely to be associated with the measures identified;
- Preparation of blueprints for implementation of an appropriate EMS at each facility.
- Delineation of NEPA's monitoring and reporting requirements.

6.2.2.6 The consultants have produced well-documented case studies covering their work with each of the five subject firms. NEPA should consider publishing them on the Agency's website where they might serve as examples to other industrial enterprises.

6.2.3 **Funds for Assistance to Industries**

6.2.3.1 One of the tasks of the TOR for component B called for the consultants to "*Develop and/or leverage existing revolving funds to help finance improvements in the operations of industries so as to reduce/eliminate the harmful impacts of discharges of trade effluent into Kingston Harbour*.

In formulating their Funding options the consultants roughly estimated that the size of the Fund would have to be about US $18.4 million. They envisaged that in order for the Fund to be attractive to industries it would have to be able to lend at rates of 5 or 6%, i.e. significantly lower than the best rate available from the commercial banking system, which was around 9%. The consultants anticipated that the NEPA Fund would have to be successful in garnering substantial amounts of grant funds to blend with moneys obtained from normal sources of financing, in order to be able to lend at 5 or 6%.

As documented in their Deliverable B4, the consultants developed four Fund options -Schemes A, B, C, and D, the main features of which are summarized in Table 4 below, reproduced from Claude Davis' B4 report.

Table 4: Fund Options Proposed by Claude Davis & Associates

Aspect	Scheme A	Scheme B	Scheme C	Scheme D
Source of Funds	Local and international institutions	Local and international institutions plus seek environmental bonds issued by IFI	Local and International institutions	Local institutions only. Seek funds from EFJ at low interest rate (say 3%) and matching funds from a local bank at ~ 8%.
	50% of discharge fees (and fines if approved) paid into fund	50% of discharge fees (and fines if approved) paid into fund		50% of discharge fees (and fines if approved) paid into fund
Shared loss	Seek shared loss (50%) arrangement from an international agency			
Fund Management	Managed by DBJ	Managed by commercial banks	Commercial banks	Managed by single commercial bank in association with NEPA
Target interest rate to borrowers	5% to 6%	5% to 6%	5% to 6% NEPA to subsidise interest payments by paying commercial banks from discharge fees and IFI grants	5% to 6%
Application Fee	No application fee			
Approval of loan application	NEPA to approve environmental aspects, commercial banks to approve financial aspects			
Disbursement	Disbursed to borrowers through AFIs who could charge a spread of up to 200 basis points (2%)	Disbursed by DBJ directly to borrowers	Disbursed by commercial banks	Disbursed by commercial bank
	Disbursement also requires NEPA approval by adherence to licence conditions			
Monitoring	NEPA to monitor all environmental aspects of loan approval and monitoring			
	DBJ to monitor financial aspects of loan	DBJ to monitor financial aspects of loan	Commercial banks to monitor financial aspects of loan	Commercial bank to monitor financial aspects of loan
Loan Revenues	All loan repayments and any fund revenues to returned to the NEPA Fund			

6.2.3.2 For the following reasons, the consultants recommended adoption of Scheme A:

- Scheme A would allow quick and easier implementation and distribution of funds through financial intermediaries;
- Both Scheme A and Scheme C would allow the NEPA Fund to leverage existing relationships between the identified 55 polluting companies and their banks. However, Scheme A would allow the NEPA Fund a greater degree of control on the final cost of funds to the borrower while allowing the banks to compete within a spread of up to 2%.
- The active promotion of the NEPA Fund through the commercial banking system could help to motivate tax and environmental compliance as the basis for business development throughout the nation.

6.2.3.3 The Terms of Reference for Component B also required the consultants *" To assist NEPA to bring the Fund to market".*

In September 2005, having completed drafting of their optional Funding Schemes, the consultants informed NEPA that they were of the opinion, that in light of the following unfulfilled expectations, it would be premature to try to bring the Fund to market at that time:

- No firm commitment has been secured from any local or international funding source for participation in the NEPA Fund;
- The Wastewater and Sludge Regulations have not yet been promulgated;
- Documentation has not yet been prepared for appropriate protocols and procedures for management and operation of the Fund;
- Essential human and physical resources are not yet available for establishment of the Fund.

6.2.3.4 It was subsequently agreed between NEPA and Claude Davis, that in lieu of "assisting NEPA to bring a Revolving Fund to market", the consultants would prepare model forms of application to facilitate and encourage existing industries to seek access to the current EU/JAMPRO grant funds for assistance to improve the competitiveness of Jamaican micro, small and medium-sized enterprises, (MSMEs.)

6.2.3.5 The consultants have satisfactorily fulfilled this arrangement by producing a document containing five types of model forms of application or templates to assist certain types of industries to make effective applications to JAMPRO to access their Private Sector Development Programme grant funds. The five types of industries for which templates are provided are:

1. Manufacture of soft drinks; production of mineral waters;

2. Processing and preserving of fruit and vegetables;

3. Distilling, rectifying and blending of spirits; ethyl alcohol production from fermented materials;

4. Manufacture of paints, varnishes and similar coatings, printing inks and mastics;

5. Production, processing and preserving of meat and meat products.

6.2.3.6 In September 2005, NEPA appointed an *Officer-Environmental Management Systems (EMS),* whose job description includes, amongst others, the following relevant functions:

- Develop and implement projects to promote the uptake and sustainability of EMS in Jamaica

- Assist with establishing and maintaining EMS pilot projects within industrial sectors, and provide technical support to project groups

The model application forms prepared by Claude Davis will be made available to NEPA's newly appointed EMS Officer, and it is envisaged that the forms will be utilized by the Officer in assisting industrial operators to access funds to enable them to upgrade their production processes, thereby eliminating harmful waste discharges to the harbour.
While the EMS officer is being identified as one who will be able to make immediate use of the model forms, it is not unlikely that other officers in other NEPA Branches could also make use of them.

6.3 COMPONENT C

6.3.1 Site Selection for Ship-waste Reception Facility (WRF)

6.3.1.1 KPMG's efforts towards identifying a suitable site for location of the required ship-waste reception facility are documented in their C1 report titled "*Siting Study for Waste Reception Facilities for the Port of Kingston.* After preliminary screening of a total of eight possible sites, four were short-listed for detailed consideration –Gordon Cay, Soapberry, Greenwich and Newport East. The consultants developed a set of evaluation criteria which they used to assign numerical ratings of the suitability of each site in relation to each evaluation criterion. It can be seen from Table 5 below, taken from KPMG's C1 report, that the consultants rated Greenwich (2 hectares) as the most suitable site for construction of a facility that would have capacity to treat both garbage and oily waste from ships discharging in the port of Kingston. In the event that the facility would only be required to be able to treat oily waste, the consultant's analysis indicated that the Newport East (1 hectare) site would be best suited.

Table 5: KPMG's Ranking of Sites for Ship-Waste Reception Facilities

		Gordon Cay	Soapberry	Greenwich	Site adjacent to Newport Mills (Newport East)
■	Shortest distance between the treatment facility and Port Bustamante (location of greatest shipping activity)	10	6	8	7
■	Security clearance (entrance and exit)	2	8	8	8
■	Hindrance to other Port operations minimal	2	10	10	10
■	Land space to meet current & future needs	0	2	9	0
■	Site security	9	3	4	8
■	Site accessibility (for employees and vehicles)	7	4	8	9
■	Easy disposal of effluent (from treatment of oily waste)	3	8	8	7
■	Proximity of Riverton City Disposal site	8	10	8	7
■	Potential to improve economies of scale by treating land based waste	1	8	8	8
■	Minimal risk for wastes to enter the water[2]	10	3	10	10
■	Minimal impact to surrounding community especially with respect to noise, odour and outer appearance	5	9	8	7
	Total	**57**	**71**	**89**	**81**

[2] The score allocated to the Soapberry site is when a barge is used to transport waste from the Port to that site

6.3.2 **Options for Investment, Ownership and Operation of the WRF**

6.3.2.1 Options for Investment

KPMG's C2 report identified PAJ and NSWMA as two public sector Agencies which, in view of their special national responsibilities in regard to international shipping and solid waste management respectively, were expected to be very keenly interested in any opportunity to participate in establishment of a WRF for the port of Kingston. Two of the larger private sector waste management companies operating in the KMA showed some cautious interest in investing in the project, but the Shipping Association of Jamaica (SAJ) has been consistently the most supportive private sector stakeholder organization that has participated in this initiative towards establishment of a ship-waste facility for the port of Kingston.

6.3.2.2 Options for Ownership

KPMG's C2 report identified four options for ownership:

Option # 1 - Single ownership by the PAJ

Option # 2 – Joint Venture ownership by the PAJ and a private sector entity. (Note: The SAJ is acknowledged to be a private sector organization).

Option # 3 – Single ownership by a private sector entity;

Option # 4 – Ownership by a consortium including PAJ, NSWMA and private sector operators at the port of Kingston.

6.3.2.3 Options for Operation

The consultants' report suggested that the administrative management and technical operation of the ship-waste facility were functions that could be carried out either by appointee(s) of a single owner, or multiple owners.

6.3.2.4 Conclusions and Recommendations

Having weighed the advantages and disadvantages of the various scenarios suggested for the Waste Reception facility (WRF), the consultants recommended that the required technical and financial models be prepared in accordance with the following three Options:

Option # 1 - WRF owned and operated by PAJ.

Option # 2 – WRF owned and operated by a consortium consisting of PAJ, NSWMA and private sector operators at the port of Kingston.

Option # 3 – WRF owned and operated by SAJ or other private organization.

6.3.3 **The Key Features of the Technical and Financial Models for the WRF**

6.3.3.1 **Technical Models**

The definitive features of the technical models for dealing with both Annex I (oily waste) and Annex V (garbage) from ships were as follows:

6.3.3.1.1 Annex I (Oily Waste):

(1). Collection tanks installed at Newport West, Rockfort and Port Royal;

(2). Treatment plant established at Greenwich;

(3). Oily waste from the Newport West collection tank pumped across to Greenwich, but waste collected at Rockfort and Port Royal to be transported by road tanker to Greenwich ;

(4). Recovered oil to be mixed with bunker C and sold;

(5). Sludge to be land-farmed at Greenwich;

(6). Wastewater from Greenwich to have less than 10ppm oil and grease, and if so may then be discharged directly to the harbour.

Note:

- As an alternative to (3) above, the cost-effectiveness of using a motorized barge to collect oily waste from ship-side might bear further detailed investigation;
- The financial viability of the project would be enhanced if the treatment plant could attract significant volumes of waste oil from land-based enterprises.

6.3.3.1.2 Annex V (garbage):

(1). The Quarantine Authority must be notified and must give clearance before any garbage can be accepted;

(2). Ship waste must be pre-sorted;

(3). Collection skips installed at Newport West, Rockfort and Port Royal;

(4). Skips to be transported by truck from collection points to Riverton;

(5). A manifest system to be implemented to establish chain of custody for ship-waste from pick-up to disposal.

6.3.3.2 **Financial Models**

The major assumptions underlying the financial models are shown in Table 6 below, taken from KPMG's C3 report:

Table 6: KPMG's Assumptions Underlying the Financial Models

Description	Assumptions underlying projections
Legislative Framework	**The establishment of appropriate national legislative framework for regulating port reception facilities – this assumption is of paramount importance.**
International Maritime Organisation (IMO's Best Practice Guidelines)	**The Maritime Authorities in Jamaica adopt and implement IMO's *Comprehensive Manual on Port Reception Facilities* as a starting point for achieving compliance with MARPOL 73/78.**
Official waste management plan	The preparation and implementation of an official waste management and handling plan - the *operations at Port Bustamante will be required to put in place a waste management plan.*
Waste Treatment	**Where waste treatment is required prior to reuse, recycling or disposal, this occur.**
Charges for using waste reception facilities	**The costs of establishing port reception facilities are to be recovered through the collection of mandatory and variable fees from ships.**
Role of Port Authority of Jamaica	**The Port Authority of Jamaica takes all necessary steps and provides assistance for the proper operation of Reception Facilities for oil and garbage, and for encouraging all visiting ships to make use of these facilities.** *The role (regulatory and otherwise) of the Port Authority of Jamaica is critical to the project to establish the waste reception facilities.*
Disposal of solid waste	**Solid waste is disposed of at municipal landfill sites, through arrangements with the NSWMA.**
Recycling of oily waste	**Oily waste collected, is processed and sold as a fuel, to "heavy industries and power stations".**
% of oil and water in oily waste	**30% oil and 70% water.**
Operating cost for oily waste	**US$0.66 per gallon1**
Selling price of re-cycled oily waste	**US$1.05 per gallon2**
Increases in revenue and cost	**Increase by 4%3 per annum (estimated projected rate of inflation in the United States of America)**
Taxation	**Taxation is ignored**
Initial life of project	**15 years**
Revenue and costs commence	**Year 1**
Terminal value of project in year 15	**The terminal value was arrived at by assuming that cash flow in year 15 will eventually stabilised and, therefore, the stabilised cash flow can be capitalised into perpetuity and discounted back to present value.**

1 Source: Developed by KPMG from waste oil industry sources (Jamaica, Europe & USA).
2Source: Developed by KPMG from waste oil industry sources (Jamaica, Europe & USA)
3 InflationData.com

6.3.4 **The Bid Documents for the proposed WRF**

6.3.4.1 As required under their contract with NEPA, the consultants KPMG have prepared a document for NEPA, (or any other agency which government might choose to implement the project), to use to invite proposals for establishment of a suitable ship-waste reception facility for the port of Kingston. The Terms of Reference required that the consultants, in carrying out the assignment, were to be guided by two overriding considerations: 1). that the options explored should meet the needs expressed by the GOJ sponsors, and 2). that the options must be structured to attract investors to bid for establishment of the required facilities.

6.3.4.2 KPMG has produced a set of bid documents for ship waste reception facilities for the port of Kingston which it is believed would satisfy Jamaica's obligations to the international maritime community, as a signatory to the MARPOL 73/78 Convention. However, the consultants' final report has indicated, that whereas at the outset there was general expectation that a business venture could be formulated which would be attractive to private investors, in the actual event, this turned out not to be the case, as evaluations of the most realistic financial model indicate that the Financial Internal Rate of Return would only be around 4%. The significant factors giving rise to this outturn are explained below:

6.3.4.2.1 The critical features of the most realistic financial model are:

- Project revenues expected to come from two components:

  (i). A mandatory fixed fee of US $100 chargeable to each vessel entering the port, regardless of whether or not it had waste that it wanted to discharge;

  (ii). A variable discharge fee based on the actual volume and type of waste discharged.

- Projections of growth rates in the volumes of ship traffic, waste oil, and garbage based on three different scenarios as follows:

  (a). Pessimistic: ship traffic 1%; waste oil 2%; garbage 2%;

  (b). Most Likely: ship traffic 2% waste oil 3%; garbage 2%;

  (c). Optimistic: ship traffic 4% waste oil 4%; garbage 4%;

- The size of the required capital investment assumed not to vary significantly for each of the three growth rate scenarios.

6.3.4.3 In the case where revenues were expected to come from both a mandatory fixed fee as well as a variable discharge fee, financial analysis gave very attractive rates of return for all three volume projections: Pessimistic, 20.63%; Most Likely, 21.92%; and Optimistic, 24.38%.

6.3.4.4 But in the case where significant revenues are expected to come only from collection of a variable discharge fee, the financial analysis gave the following very unattractive FIRRs:

Pessimistic: 3.55%; Most Likely: 4.01%; Optimistic: 4.50%.

6.3.4.5 However, it should be realized, that in regard to the apparent unattractiveness of the ship-waste facility as an investment opportunity for entrepreneurs, the basic shortcomings reside in the relatively low volumes of growth in the international shipping projected for Kingston. If the projected growth rates were higher, then there would be correspondingly greater volumes of waste to be handled, and hence more favourable income streams accruing from volume-based waste-reception fees. In this connection, the information given in Appendix E concerning substantial new business recently secured for the port, could mean that in the near future the prospects for higher growth rates in the volume of international shipping using the port of Kingston, might actually be considerably better than anticipated by KPMG in their financial analyses.

7. CRUCIAL ISSUES REQUIRING FOLLOW-ON PROJECTS

In their *Institutional Arrangement Report* the Consultants for Component A have outlined a comprehensive Action Plan, (Refer to Appendix F), identifying most of the wide range of issues which need to be addressed in order to effect remediation and enhanced environmental management of Kingston Harbour. In sections 7.1 to 7.11 below, the Kingston Harbour Project Unit draws attention to some crucial issues which deserve to be highlighted as matters urgently requiring follow-up attention, in order to capitalize on the considerable momentum generated by this project towards rehabilitation and sustainable development of the harbour.

7.1 Implementation of the best-suited institutional framework for management of Kingston Harbour

7.2 Final calibration of 3-D Water Quality Model (WQM)

7.3 Constitution of a Monitoring & Advisory Committee for KMA Wastewater Systems, (Focus on Soapberry)

7.4 Study to evaluate the technical and economic feasibility of keeping Soapberry treated effluent on-shore for beneficial re-use.

7.5 Further assistance to industries for implementation of EMS

7.6 Further initiatives towards implementation of a ship-waste reception facility for the port of Kingston.

7.7 Continuing Public Education

7.8 Pilot project for trapping gully garbage at shoreline

7.9 Palisadoes Conservation Project

7.10 Study to address sedimentation of Hunts Bay

7.11 Pre-feasibility study for Kingston Harbour Bridge

7.1 Institutional Framework for Management of Kingston Harbour

7.1.1 The consultants have carried out their Terms of Reference and recommended institutional and legal changes which, in their view, would establish an entity *...with the breadth and authority to lead and coordinate, but not supplant, the appropriate functions of existing agencies and other stakeholders".*

7.1.2 In the latter stages of the process towards formulation of the best-suited institutional framework, three models were short-listed. (See Appendix C). Finally the following two emerged with the strongest and widest stakeholder support:

(1). The MLE/NEPA Framework. This model envisages that:

- The Minister of Land & Environment (or his nominee) would be the top decision-maker on behalf of government;
- This model allows room for inputs from representatives of other Ministries who would have presence on the Kingston Harbour Monitoring and Advisory Council, a key element of the model. But effectively, MLE would be in charge, and MLE would be the driver.

(Note: This type of institutional framework has actually been the one under which this ATN/SF-8164-JA project has been executed.)

(2). The Kingston Harbour Corporation, (KHC), model envisages that:

- The Board of a Kingston Harbour Corporation, a private-sector led, private-sector driven entity, would be the top decision makers;
- The proponents of this model would prefer that the reporting regime, when finally established, does not place the KHC under any particular Minister, but that the Board should report directly to the PM/Cabinet.

(Note: This is the model firmly recommended by the consultants. It would be very similar to the existing Urban Development Corporation, a statutory body which is not under any particular Ministry, but reports directly to the Office of the Prime Minister. Since inception, over thirty years ago, UDC Boards have always been chaired by private-sector leaders.)

7.1.3 While it is certainly true to say that a clear majority of stakeholder participants has endorsed the KHC model, the institutional framework recommended by the consultants, it does bear mention that a significant number of stakeholders, chiefly public sector officials, remains unconvinced that the recommended private-sector led, private-sector driven Kingston Harbour Corporation, would prove to be more effective in protecting and developing the harbour than the MLE/NEPA model.

7.1.3.1 Supporters of the MLE/NEPA model point out that:

(i). The proposed new entity would not have the legislative authority currently vested in the MLE/NEPA regime, which is necessary for the Board to be able to impose its will in any situation which may require government intervention to protect the harbour environment; and it will likely take a long time for drafting and passage of all the legislative enactments that would be required in order to effectively empower the new entity. Moreover, the proponents of the KHC model have not convincingly explained how it might be possible to legislate empowerment of the KHC model without, in effect, displacing or duplicating the authority currently vested in some existing government institutions.

(ii). If the MLE/NEPA model were to be implemented, it is likely that MLE would choose persons from the private sector to chair the proposed Kingston Harbour Monitoring and Advisory Council, as is generally the case with government–appointed Boards.

(iii). The proponents of the KHC model have not convincingly shown how/why this institutional arrangement can be expected to be more effective in managing the harbour than the MLE/NEPA model.

7.1.4 Nevertheless, if the consultants' recommendations are to be implemented, it is now up to the MLE to lead the way in taking action to:

(1). Obtain final consensus on the institutional framework;

(2). Prepare, and effect, a Cabinet Submission,

covering critical issues such as:

(a). General administrative and operational protocols;

especially in relation to clarifying jurisdictional boundaries so as to avoid possibilities of overlapping, and duplication of roles, amongst the various relevant Authorities.

(b). Identification of whatever enhancement of management efficacy the new entity would be expected to provide for Kingston Harbour;

(c). How appointments to the Board would be made;

(d). Options for obtaining financial support for the entity;

(e). A budget estimate of the cost of setting up the new entity.

7.1.5 The Project Unit anticipates that if and when Cabinet responds to MLE saying that the KHC is to be implemented, MLE and NEPA will very likely have to collaborate and seek to obtain the necessary financing for a project to set up the new entity.

The broad Terms of Reference for such a project would be to:

"Implement Cabinet's decisions, including if necessary, drafting and enactment of new legislations for setting up the KHC"

7.2 Final Calibration of 3-D Water Quality Model, (WQM)

7..2.1 There was neither adequate time nor resources available within the scope of this project to allow for carrying out an appropriate programme of fieldwork and labwork to collect the full series of data which is essential for final calibration of the WQM. Because of this, the WQM, as it is, is not yet completely functional. The consultants have advised that in order to up-grade the model to complete functionality, an extended programme needs to be carried out to obtain quality data such as: current speeds and spatial variations; dye dispersion patterns; rates of vertical mixing, (temperature, salinity, dissolved oxygen profiles); river and gully gauging; BOD loadings, nutrient and algae time series; sedimentation rates.

7.2.2 The most productive method by which the required data may be acquired would be via a programme of fieldwork involving appropriately qualified staff members of key stakeholder institutions, rather than merely engaging outside consultants to supply the data.

7.2.3 For successful long-term application of the WQM, it is strongly recommended that all potential users be afforded meaningful opportunities to become thoroughly familiar with the data collection process; and the best way of achieving this will be to arrange for them to be actively and directly involved in the actual collection process. It is therefore proposed that NEPA should initiate discussions with other relevant institutions such as NWC, WRA, ECD, and UWI, with a view to formulating a programme for collecting the required data, involving the active participation of selected members of the staffs of each institution.

7.2.4 It is envisaged that it will take 12-15 months to carry out a suitable programme of fieldwork and labwork to generate the necessary data, and external financial assistance will most likely have to be sought to procure additional equipment and engage the services of a computer modeling expert to coordinate the programme, and complete the training of local personnel in the use and application of the model.

7.2.5 The work of gathering additional data to complete calibration of the WQM should best be designed to fit within a comprehensive national programme for coastal water quality monitoring. Current documentation of NEPA's overall monitoring programme is limited to that which is included in the Agency's Corporate Plan. It is recommended that a detailed programme be developed and fully documented.

7.3 Constitution of a Monitoring & Advisory Committee for KMA Wastewater Systems, (Focus on Soapberry).

7.3.1 The view has long been widely held, that historically, National Water Commission has not performed satisfactorily in regard to management of the numerous wastewater treatment plants all over the island, for which they are responsible. And so, between 1999 and 2003, when major new central wastewater treatment and disposal systems were coming on stream in the major resort towns of Negril, Montego Bay and Ocho Rios, National Water Commission, with active encouragement and support from the GOJ/USAID CWIP project, instituted special arrangements to ensure competent, effective management of the new facilities, so as to safeguard the quality of the coastal waters of those areas, which is so critically important for sustainability of the local tourist industry. The outcome of this was the setting-up of Monitoring and Advisory Committees (MACs) for Negril, Montego Bay and Ocho Rios.

7.3.2 Typically, the purpose and objectives of the MACs are chiefly:

- To prevent negative health and environmental impacts, (air, water), in the vicinities of the plants, due to system failures;
- To allow for private sector participation, community and stakeholder inputs, into the wastewater management process;
- To provide opportunities for NWC to develop a more business orientated approach towards wastewater management;
- To provide opportunities for NWC personnel to bring other existing treatment plants up to standard without overburdening the Commission's available manpower and management resources.

7.3.3 On January 31st, the Prime Minister broke ground at Soapberry in an official ceremony to mark commencement of construction of a major wastewater treatment plant for the Kingston Metropolitan Area. (See press report at Appendix B). Phase 1 of the project will take 2 years and will cost approximately US $50 million. This first phase is expected to deliver a system with capacity to adequately treat around 18.5 million gallons of sewage per day. It is planned that the treatment capacity at Soapberry will be expanded in future phases up to a total of around 60 mgd, to satisfy the total requirements of the city.

7.3.4 It is hereby suggested, that NWC and NEPA should take action to set up a Monitoring and Advisory Committee for the Wastewater Systems of the KMA. This initiative is urgently required because, obviously, if the Kingston MAC is functioning from the very start, during the actual construction of the facilities, then through attendance at site meetings, etc., members will have maximum opportunities to be fully informed in relation to the technicalities of the system, and should therefore be better equipped to fulfill their Monitoring and Advisory responsibilities. This call for a MAC for Kingston is not at all new. The original call was made by a past NEPA CEO in May 2002. (See newspaper clipping at Appendix G)

It is suggested that the Kingston MAC be comprised of representatives from the following institutions: NWC, NEPA, MLE, ECD, WRA, SRC, JMA, KRC, KSAC, and the NGO sector.

7.3.5 In preparing Terms of Reference for the Kingston MAC, it should be useful to review the TORs and modus operandi of the existing three regional MACs, in order to learn from their experiences. The following are some of the key functions that should be included in the Terms of Reference for the Kingston MAC:

- Monitor, assess and evaluate the construction, management, maintenance and delivery of wastewater services in the KMA, and make recommendations to the relevant authorities for improvements and extensions;
- Liaise, interact and consult with the user community and other stakeholders to obtain or transfer relevant information concerning any plans, programmes, problems, constraints or solutions relating to the collection, treatment and disposal of KMA wastewater;
- Share, discuss and disseminate water quality data with a view to ensuring that required effluent quality standards are being met, and that best practices are being followed in operation and maintenance of KMA wastewater systems so as to safeguard public health;
- Promote, implement and monitor public education activities that will encourage KMA residents to connect to available public systems, and inculcate proper behaviour of citizens in regard to usage of the systems.

7.4 Study to Assess the Technical & Economic Feasibility of Keeping Soapberry Treated Effluent On-Shore for Beneficial Re-Use

7.4.1 Soapberry was first identified as the best-suited site for location of the proposed major wastewater treatment facilities for the KMA, from around the mid 1980's. Since then, further studies by SENTAR (1993), and NORPLAN (1997), have endorsed the selection of Soapberry. The history surrounding the matter will show that the chief considerations in favour of Soapberry were:

(i). The site was ideally located for the FLOW WEST concept;

(ii). FLOW WEST meant that the sewage collection system would be designed to flow westwards from central Kingston, towards the plains of southeast St. Catherine, a very important agricultural region;

(iii). In the past, a considerable portion of the surface waters of the Rio Cobre has been diverted to irrigate sugarcane plantations in south-east St. Catherine, thereby reducing the domestic supply available for Kingston;

(iv). Kingston is facing water shortage, which could be alleviated if the amount being diverted from the Rio Cobre for agriculture were to be released to Kingston -by using treated effluent from Soapberry as sub-stitute;

7.4.2 In summary, the most compelling consideration in favour of Soapberry was that the FLOW WEST option offerred a clear possibility for beneficial re-use of treated effluent. However, the design for the Phase 1 module of the KMA Wastewater Treatment Plant, which is currently under construction at Soapberry, envisages discharge of treated effluent directly into the mouth of the Rio Cobre, thence indirectly into Kingston Harbour.

7.4.3 In light of the above, the Project Unit hereby wishes to suggest that NEPA should consider formulating a project to rigourously investigate the technical and economic issues concerning the feasibility of implementing Constructed Wetlands for tertiary treatment of Soapberry effluent,instead of discharging the treated effluent out into the harbour. It might be too late to get the necessary design changes agreed so as to effect re-use of the Soap-berry Phase 1 effluent, but more definitive studies might convince future designers to keep the treated wastewater on-shore for beneficial re-use.

7.5 Further Assistance to Industries for Implementation of EMS

7.5.1 One of the main objectives of Component B was to support NEPA by providing assistance to industries in the Kingston Harbour area to encourage them to implement cleaner production operations, thereby eliminating or reducing the harmful effects of inflows of industrial effluents into the harbour. One of the key strategies that was to be adopted towards fulfillment of this objective was to set up a revolving fund from which industries would be able to access relatively inexpensive loans (at 5% or 6% rates of interest, instead of the minimum 9% obtainable from local commercial banks) to finance retro-fitting/upgrading of their production plants.

7.5.2 However, for reasons given in section 6.2.3 above, it was deemed impracticable at the present time, to attempt to set up a revolving fund to provide affordable loan financing for industries; but it was noted that currently there are two sources of financial assistance which should be even more attractive than the originally proposed revolving fund would have been, to any local MSME desirous of obtaining financing for implementing EMS. The two sources referred to are:

(1). *The PRIVATE SECTOR DEVELOPMENT PROGRAMME, (PSDP)*
funded under the 9th European Development Fund
coordinated by the Jamaica Promotions Corporation (JAMPRO).

The PSDP is a four-year technical assistance programme jointly funded by the European Union and the Government of Jamaica in the amount of approximately $J2.3 billion, offering grant funds to qualified applicants to develop and strengthen Jamaica's private sector.

(Refer to Appendix H for more detailed information); and

(2). *The CARICOM TRADE SUPPORT PROGRAMME, (CTSP)*
funded by the Government of Trinidad and Tobago.

The CTSP is US $16 million programme under which interest-free loans are offered firms in CARICOM, except those located in Trinidad and Tobago, for the purpose of procuring technical assistance/consultancy service and/or training programmes, among others, for business development projects.

(Refer to Appendix J for more detailed information).

7.5.3 In view of the availability of the sources at (1) and (2) above, the Project Unit sought and obtained the concurrence of the IDB to request the consultants to abandon the original task of trying to set up a revolving fund, and to instead prepare appropriate model forms of application to facilitate existing industries' access to the JAMPRO or CARICOM or other Funds to implement EMS.

7.5.4 In late 2005, NEPA appointed an Environmental Management Systems (EMS) Officer, whose job description includes the following relevant functions:

- **C**oordinate implementation of EMS within the Agency;
- Develop and implement projects to promote the uptake and sustainability of EMS in Jamaica;
- Assist with establishing and maintaining EMS pilot projects within industrial sectors, and provide technical support to project groups;
- Assist with the development and implementation of a recognition and reward system for organizations that adopt and effectively utilize EMS;
- Carry out assessments of the effectiveness of EMS strategies on the levels of pollutant loads from point and non-point sources.

7.5.5 It is hereby suggested that a follow-on project be executed which, over the next two to three years while the JAMPRO and the CARICOM Funds remain available, will entail utilization of the model application forms by NEPA and other local entities to facilitate access to the Funds by existing MSMEs for the purpose of implementing EMS.

7.6 Further Initiatives Towards Implementation of a Ship-Waste Reception Facility for the Port of Kingston

7.6.1 As previously mentioned, the financial analysis done by KPMG was based on two scenarios, viz:

(i). One in which the bulk of the project revenue would come from two separate streams, i.e. a ***mandatory fixed fee,*** and a ***variable discharge fee***; and,

(ii). Another in which the fixed fee was not allowable, and the ***variable discharge fee*** alone would have to be the major source of revenue for the project.

In the case where revenue was coming from two streams, the expected Financial Internal Rate of Return (FIRRs) were quite attractive –well over 20%. But in the case where revenues would only come from collection of a variable discharge fee, the FIRRs were unattractive –only around 4%.

7.6.2 Under the prevailing institutional/economic conditions, the case where significant revenues for the proposed ship-waste facilities can be expected to come only from variable discharge fees must be viewed as the realistic case, because, after serious consultations with the top leadership of the Port Authority of Jamaica, the government Agency which holds final jurisdictional authority in these matters, it is clear that PAJ would not be willing to endorse any proposal to impose a fixed fee on all international marine traffic entering the port of Kingston for the purpose of supporting the viability of ship-waste reception facilities.

7.6.2.1 The PAJ's attitude in this regard is anchored in the fact that no such fee is in force at any of the other major transshipment ports in the region, which are in fierce competition with Kingston, and to institute such a charge for entering Kingston would be putting the nations enormous investment in development of the Kingston Transhipment Port at a significant disadvantage.

7.6.3 However, it should be recognized that the basic shortcomings in regard to the questionable attractiveness of the ship-waste facility as an investment opportunity for entrepreneurs, reside in the relatively low volumes of growth in the international shipping projected for Kingston. If the projected growth rates were greater, then there would be correspondingly greater volumes of waste to be handled, and hence more favourable income streams accruing from volume-based waste-reception fees.

7.6.3.1 In this connection, it bears mention that in November 2005, public announcements were made (See press report at Appendix E), concerning major new contracts being secured with leading shipping lines which will bring dramatic increases in the volumes of international marine traffic coming to Kingston, promising substantial enhancements to the revenue streams of any business operating ship waste reception facilities in the port of Kingston.

7.6.4 And so, notwithstanding the apparently unattractive case that the KPMG final report has presented, the Kingston Harbour Project Unit is of the firm opinion, that as originally intended when Component C was being formulated competitive tenders should be called for establishment of ship-waste facilities for Kingston. This opinion derives from a perception formed during the process of involvement in the KPMG studies, that it is not at all unlikely that there may be existing entrepreneurs operating in the local shipping and waste-management sectors, which will enthusiastically welcome the opportunity to make offers to provide appropriate ship-waste reception facilities for the port of Kingston.

7.7 Continuing Public Education

7.7.1 The team of Consultants which prepared the Public Education and Outreach campaign for this project, and assisted NEPA in the execution thereof, has delivered several tangible outputs which have generated such positive responses from amongst target audiences, that the Project Unit would suggest that a follow-on project be developed to continue utilization of these special products. The products which deserve to be further utilized are: the educational modules, the 18-minute video, scale model, posters, sample billboards, sample newsletter, and the prototype Kingston Harbour website that is currently being hosted as a linked sub-web on the NEPA website. Some suggestions are given below as to how these products may be further utilized:

7.7.1.1 Educational Modules, the Video and the Physical Model

In the course of delivery of the Pub. Ed. Campaign, two workshops were conducted with two different groups of teachers and students from Kingston schools. The main objectives of the workshops were:

(a) To give NEPA, the Pub. Ed. Consultants, and Ministry of Education curriculum development officers who were involved with the project, the opportunity to observe the reactions of some primary targets (Kingston teachers and students) to the materials, and thereby gain insights as to whether there were any adjustments or revisions needed to be done for improvement of the products;

(b) To provide opportunities for teachers to be able to experience actual use and application of the materials, and to evaluate how effective the materials could actually be in facilitating and supporting their teaching performance, particularly in regard to informing young people about the importance of Kingston Harbour, and inculcating in them positive attitudes and behaviour towards protection and preservation of its valuable ecological resources.

7.7.1.1.1 The feedback from the workshops was very favourable. The teachers expressed much appreciation for the materials as teaching tools; and the students showed great interest and enthusiasm for learning about the harbour, and why it was so crucially important to protect it from pollution.

7.7.1.1.2 Teachers from several schools have subsequently requested members of the Project Unit to visit their schools and assist with delivery of Environmental lessons on Kingston Harbour, utilizing the above products.

7.7.1.1.3 In light of the foregoing, the Project Unit would suggest that a project be implemented whereby an appropriate team of resource personnel is organized, consisting of NEPA officers and officers from Ministry of Education and the National Environmental Education Committee. The basic purpose of this team would be to maintain contact with all the Kingston Area primary and secondary schools, and arrange to visit them and conduct workshops to educate students about Kingston Harbour. It would be advantageous for the team to have at their disposal, an appropriate type of vehicle to transport themselves and the materials and equipment to workshop venues. It is felt that a project such as outlined above could make further use of the manual, the video, the model, and the posters to continue progressing towards the very worthwhile objective of fully engaging the youth of the city in the cause of protecting Kingston Harbour.

7.7.1.2 Billboards

The consultants for Component D produced several designs for bill-boards, but due to scarcity of financial resources, so far none of them have been erected. It would be very unfortunate if these outstanding designs were never to be executed. It is therefore suggested that efforts be made to obtain the necessary resources to perhaps rent space on a number of existing billboards at strategic locations around the city where they will serve to very effectively publicize the need for special attention to be given to the environmental rehabilitation and protection of Kingston Harbour.

7.7.1.3 Newsletter

Under this project a sample newsletter, 'Harbour Light', was produced, which drew comments that suggest that publication of a regular news-letter (perhaps quarterly?) could be a worthwhile initiative to implement, in order to regularly and consistently disseminate accurate, up-to-date information to stakeholders and the general public concerning the condition of Kingston Harbour.

7.7.1.4 Website

During the course of the project, a Kingston Harbour home page was created and added as a linked sub-web on the NEPA website. It is hereby suggested that continued up-grading and maintenance of this Kingston Harbour sub-web could be a very effective means of keeping the attention of a wide cross-section of the public focused on the cause of rehabilitating and protecting Kingston Harbour.

7.8 Pilot Project for Trapping Gully Garbage at Shoreline

7.8.1 Over the years, wash-down of gully garbage into the harbour during rainstorms has been one of the most intractable problems contributing towards degradation of the harbour environment. Although the scope of work for this project did not include for any specific attention to be paid towards mitigation of this problem, in 2003-2004 the Project Unit became involved in assisting two local community groups which were seeking to implement pilot projects to trap gully garbage at the shoreline. The motivation to try the approach of constructing traps at the shoreline instead of installing in-line channel screens, derives from many past failures of initiatives using in-line screens, which, due to the typical coarseness of the debris carried in most local stormwater channels –e.g. construction waste, household appliances, garden cuttings, -frequently tend to become completely clogged, causing upstream flooding of gully bank areas. It was felt that such flooding could be avoided if large catch basins were provided at the shoreline ends of the gullies –instead of in-line screens.

7.8.2 The Project Unit assisted two local interest groups at Tivoli and Rae Town to design the two different types of shoreline garbage traps illustrated in Figs 7 & 8 below. The basic considerations driving the concept of locating the traps at the shoreline are as follows:

i). Decades of efforts by the Authorities have failed to get KMA residents to desist from dumping garbage into gullies;

ii). To date, the responsible Authorities, NSWMA, NWA, KSAC, have been unable to mobilize the necessary resources -financial, human and mechanical- to clean KMA gullies effectively and consistently.

7.8.3 So far, all efforts to try to test the efficacy of the proposed shoreline traps by implementing pilot projects have failed. They have failed not really because of lack of the necessary resources, but chiefly because neither NSWMA nor NWA was prepared, at the time, to "own" the traps, and therefore to be responsible for the cleaning and maintenance of them. However, the basic idea of providing catch basins <u>at the shoreline</u> has attracted considerable support, including some from the Jamaica Institution of Engineers, which has offered to participate in the implementation of such a project, and therefore it is suggested that NEPA should persevere and re-open the matter with the new regime which came into effect at NSWMA in late 2005.

Figure 7: Low Cost Gully Garbage Trap at Shoreline

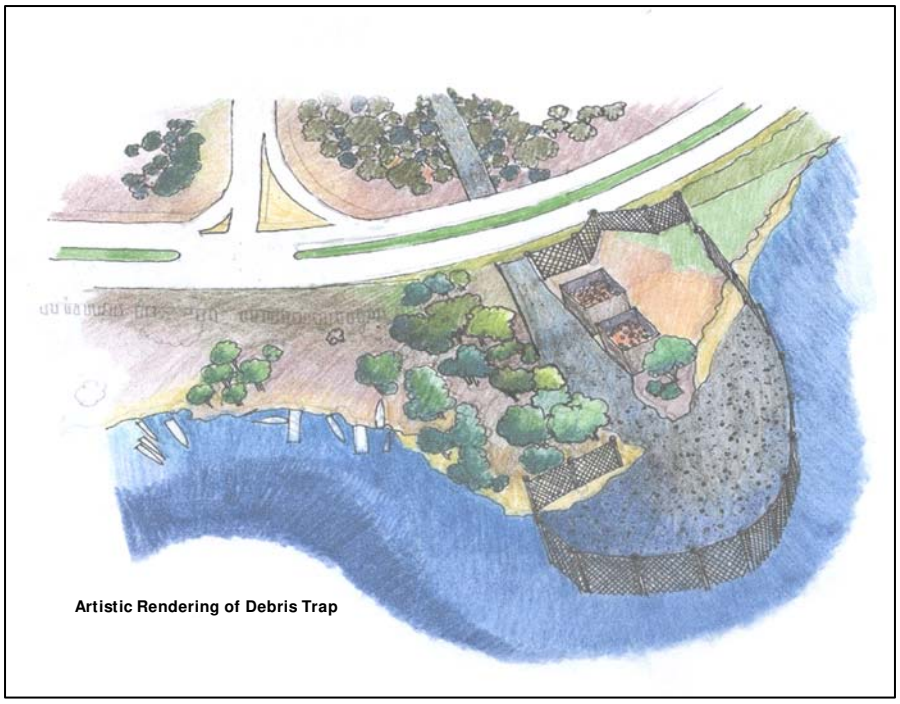
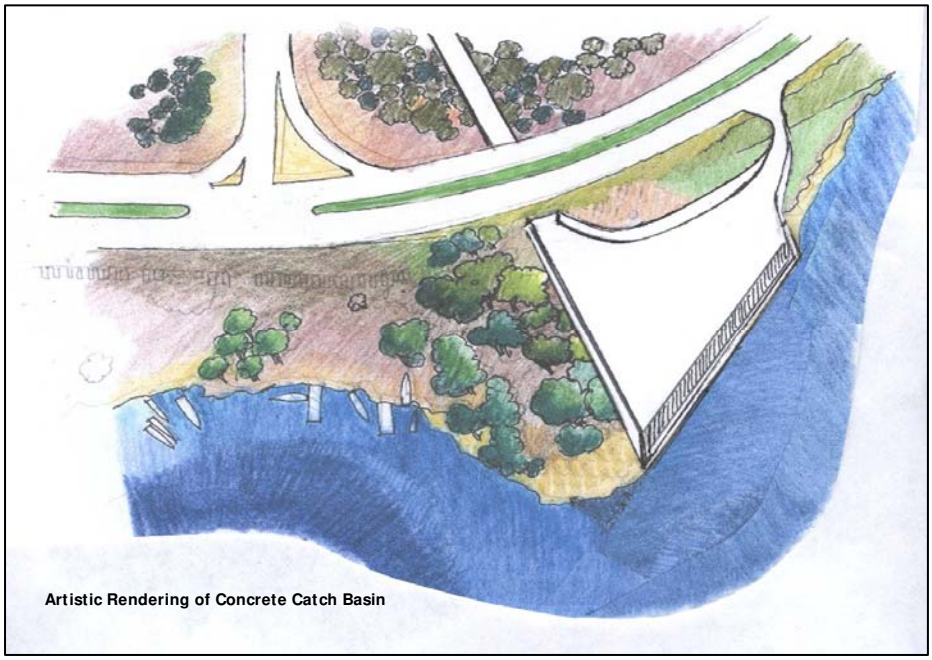


Figure 8: Reinforced Concrete Gully Garbage Trap



7.8.4 . The Kingston Harbour Project Unit hereby recommends that further negotiations be held between NEPA and NSWMA for the purpose of formulating and implementing a suitable pilot project as soon as possible. See Appendix K for brief outline of suggested pilot project). Presently, there is

no available hard data concerning the solid waste that is discharged out into the harbour via stormwater gullies. If properly planned and managed, a project such as that being proposed here could yield reliable data concerning types, volumes, and sources of the solid waste coming down into the harbour via stormwater gullies. Such information could provide the basis for formulation of new government policy initiatives which might bring some progress in the drive towards developing more effective solutions to address this very challenging gully garbage problem.

7.9 Palisadoes Conservation Project

7.9.1 The Critical Role of the Palisadoes in Regard to Conservation and Protection of Kingston Harbour

The most critical function that the Palisadoes tombolo fulfills is that it serves as a very effective breakwater, forming the deep, spacious, coastal lagoon that is Kingston Harbour, which is internationally regarded as one of the finest natural harbours of the world. This natural breakwater effectively blocks Caribbean swells and waves from entering the harbour in full force. Furthermore, Atlantic hurricanes most often approach Jamaica from the southeast, and the tombolo is so orientated that it provides a crucial first line of defense for the inhabitants of the densely populated Kingston and St. Andrew coastal areas, against the destructive effects of storm surge and wave battering that usually come with hurricanes.

Historical records show that in the past, the Palisadoes has been struck by very destructive hurricanes which have breached the tombolo. Palisadoes is the *raison d'etre* for Kingston Harbour. There would be no harbour if the Palisadoes tombolo did not exist; and the functionality of the harbour would likely be very adversely affected should there again be any serious breaching of the structure.

7.9.2 DURING SEPT. 10-11, 2004, HURRICANE IVAN CAUSED THE following list of damages at the Palisadoes. (See photos at Appendix L).

- Destruction of seawall and 16 beachfront houses at Caribbean Terrace;
- Extensive shoreline disruption; destruction of most of the beach berm and dunes along the outer edge of the Palisadoes tombolo, from Harbour View out to Gunboat Beach
- Destruction of a section of Jamaica Gypsum's concrete boundary wall;
- Extensive Damage to groynes in the groyne field near Gunboat Beach;
- Destruction of a section of revetment and specially heightened beach berm east of Plumb Point.

7.9.3 NEPA'S Special Responsibilities for Conservation of the Palisadoes

7.9.3.1 The Palisadoes tombolo, with its mangrove forests and historic archaeological sites, and the surrounding waters, with coral reefs, cays and white-sand beaches, constitute one of Jamaica's most valuable ecosystems. So much so that in 1998, under The Natural Resources Conservation Authority Act, Parliament declared the entire Palisadoes and Port Royal Cays to be a ***Protected Area***. Also, on April 22nd 2005, the Palisadoes-Port Royal Wetlands was named by the Ramsar Convention on Wetlands as Jamaica's second wetlands of International Importance. The area covers approximately 7,523 hectares and features cays, shoals, mangrove lagoons, mangrove islands, coral reefs, seagrass beds and shallow water, thus hosting a variety of under-represented wetland types, and many endangered, vulnerable and endemic species. To date, 26 endemic new species have been discovered in the area.

7.9.3.2 In view of NEPA's special responsibilities for *Protected Areas*, it is incumbent upon the Agency to take action to bring to the attention of the relevant Authorities an appropriate scope of research and engineering work that needs to be undertaken in order to learn as much as possible from the experience of Ivan, and to initiate and encourage actions for appropriate reinstatement of elements which were seriously damaged by the hurricane. To this end, members of NEPA's Coastal Zone Branch, and particularly the Kingston Harbour Project Unit, have carried out site inspections and prepared detailed Terms of Reference for a ***Palisadoes Conservation Project***, and have been making efforts to identify sources of funding for execution of the important work that needs to be done.

7.9.4 A very brief listing is given at (1), (2) and (3) below, of the most important items of work that urgently needs to be done for conservation of the Palisadoes. (However, a separate document containing detailed Terms of Reference can be made available for consideration by IDB as a possible source of funding for the proposed Palisadoes Conservation Project).

(1). *Hindcast Study to determine the Wave Climate at Palisadoes during passage of Hurricane IVAN, September 10-11, 2004; and re-assessment of vulnerability to hurricane damage*;

There has been no other hurricane over the past two-and-a-half centuries which has caused as much serious damage to the Palisadoes as Ivan has caused. This event will most likely come to be regarded as the new template against which all guidelines pertaining to land use planning, emergency management and hazard mitigation in the coastal zone will be assessed. It is therefore imperative that urgent efforts be made to carry out appropriate

studies to identify, describe and record all pertinent information that can be gleaned from the experience of Ivan.

(2). *Preparation of Designs and Tender Documents for Repair/Replacement of the Existing Groyne Field and Other Damages at the Palisadoes;*

Hurricane Ivan caused extensive erosion to sections of the Palisadoes coastline and serious damage to most elements of the groyne field. There is no doubt that these damages have gravely impaired the capacity of the tombolo to resist hurricane impacts. There is widespread perception that Ivan has left the tombolo in an extremely vulnerable condition, and should another hurricane arrive before appropriate repairs are effected, it is likely that the damage might be more catastrophic next time.

(3) *Definitive Mapping of the Palisadoes Shoreline, Setting of Baseline Controls for Future Regular Monitoring of the Shoreline and Studies to Estimate Sediment Supply for the Palisadoes*.

Based on global studies, scientists are projecting that there will be general sea-level rise of 30-55cm for the Caribbean over the next 50 years (Caribbean Environmental Outlook, UNEP, 2005). The implications of such projection, plus the clear trend of increasingly more frequent and more powerful hurricanes traversing through the region, are that there is urgent need for small island countries such as Jamaica to develop plans and systems to mitigate the potentially devastating effects of climate change, including dramatic shoreline movements over relatively flat coastal areas.

Previous authoritative studies indicate that the stability of the Palisadoes depends critically upon the supply of clastic sediment delivered by debouch from the rivers located to the east of the tombolo –particularly Hope River,Cane River and Chalky River. Cursory observations indicate that significant changes have been occurring over the years in the watersheds of these rivers, and more recently sand mining has been on the increase in the lower reaches of these river channels. It is therefore vitally necessary at this time, especially in view of the extensive disruption of the Palisadoes coastline that Ivan has caused, to carry out a comprehensive investigation of the sources of sediment supply to provide essential data for competent Authorities to plan and take action to ensure that adequate supply of sediment continues to be available to re-nourish and sustain the Palisadoes tombolo.

7.9.5 And so, the studies being called for in this proposed Palisadoes Conservation Project are chiefly intended to improve and expand the scientific and technological data base relating to its structural vulnerability. The ultimate objective is to obtain quality information which is essential to form the basis for sound decision-making in the planning of Palisadoes/Kingston Harbour infrastructure projects, and the development of appropriate guidelines for natural hazard mitigation and risk reduction.

7.10 Study to Address Sedimentation of Hunts Bay

7.10.1 Construction of Hunts Bay Causeway in 1968/69 cut off, and enclosed, the 6 square km portion of the western end of the harbour, leaving just a relatively small channel connection, only about 200m wide, between the bay and the main harbour. Thus, Hunts Bay has become a large retention basin for sediment coming down into it via Rio Cobre, Duhaney River, and Sandy Gully. Accumulation of sediment inside Hunts Bay has caused obstructions to discharge channels, reduced its capacity to cope with run-off during heavy rainstorms, and caused serious flooding problems for residents of Riverton City and Newhaven, two densly populated, low-lying communities upstream to the north of the bay. In order to alleviate such problems, government has had to allocate significant sums, on two occasions, to carry out dredging of the bay:1983,US $23 milion;2002/03. US $30 million.

7.10.2 Past studies (Stanley 1968, and CIMAB 1997) have estimated that a total of over one million tonnes of sediment is discharged into Hunts Bay annually, and it is seems that much, (if not most), of this, is retained within the bay. Apart from consistent mining, two other options have been mentioned in the literature as possible methods whereby significant reduction/elimination of the recurring problems associated with accumulation of sediment inside Hunts Bay, might be achieved:

i). Construction of a dam at Harkers Hall in west St. Mary where one of the main upland tributaries of the Rio Cobre, the Rio Pedro, passes through some very erodable soils;

ii). Diversion of the lower section of the Rio Cobre, making it discharge into the sea at a point westward of Hunts Bay.

7.10.3 But however technically attractive the dam and the river diversion options might seem to be, under the tight economic circumstances that prevails in Jamaica, it would be unrealistic to expect government to be able to fund implementation of such expensive and radical proposals.Therefore, regular and consistent removal of sediment remains by far the most realistic and achievable option for preventing high levels of accumulation of sediment inside Hunts Bay.

7.10.4 Prevention of over-accumulation of sediment inside Hunts Bay is a highly desirable objective, and if an environmentally sustainable, commercially successful, sediment-mining operation were to be established in Hunts Bay, this would redound to the benefit of all stakeholders and key players.

7.10.5 Some of the more significant benefits that could come from a commercially successful Hunts Bay sediment-mining enterprise are:

- The State would be relieved from public pressure to find resources to clean out Hunts Bay to prevent flooding of upstream communities, which has been recurring with increasing frequency in recent years;

- Increased availability of suitable construction aggregates would help to satisfy current high market demand, which is believed to be one of the root causes of some of the illegal sand mining often being reported;

- Private capital would have an opportunity to invest in a potentially viable project;

- A revenue stream would be generated for the State, in the form of royalties that would be due from any successful mining operation that is established, based upon the quantum of material extracted.

7.10.6 The physical configuration of Hunts Bay has been undergoing significant changes in recent years, due to implementation of major development projects in the area, such as the extensive land reclamation for Port Authority's transhipment port expansion, UDC's clean-out dredging, Highway 2000, and Soapberry Wastewater Treatment Plant. And so, while these projects were on-going, it would have been premature to have been attempting to carry out the types of studies required to provide essential information for assessment of the technical and economic feasibility of establishing a sediment-mining operation in Hunts Bay. Now that the dredging and reclamation works have been completed, and Highway 2000 and Soapberry have reached stages where their impacts upon the bathymetry, the hydrodynamics and the ecology of the bay can be reasonably well evaluated, NEPA can now proceed to take action to obtain vital information to put the Agency in a fully-informed position to be able to make sound decisions regarding any proposals for sediment mining in Hunts Bay.

7.10.7 In this connection, the Project Unit would advise that as a first step, NEPA should seek financial support to engage experts to carry out studies to formulate proposals for addressing the recurring problems due to sedimentation of Hunts Bay. The Terms of Reference for the studies should call for Outputs on matters such as:

i). An erosion control plan for the Rio Cobre Watershed.
This should include use of vegetative cover, check dams, drop structures, terracing, contour farming, and implementation of effective watershed protection policies;

ii). A plan for flood protection of the banks of the lower Duhaney River (Newhaven), and Riverton City .This plan should include full provision for interior drainage of the protected areas.

iii). Estimates of the average annual rate of sedimentation occurring in Hunts Bay;

iv). Particle size fractions –silt, sand and gravel;

v). Descriptions and evaluations of optional equipment and techniques for mining sediments out of Hunts Bay, e.g:

- Use of tracked, mobile, dragline equipment, operating from the shoreline;
- Use of equipment operating from fixed platforms situated at strategic locations within the bay;
- Use of mobile hydraulic dredgers;
- Any other arrangements deemed practicable for mining sediments out of the bay.

7.11 Pre-feasibility Study for Kingston Harbour Bridge

7.11.1 Urban Development Corporation (UDC), and Kingston Waterfront Re-development Company (KWRC), are two statutory bodies formed by GOJ in the late 1960's. The UDC's mandate gave them ultimate planning authority for designated areas in major towns and cities, and the KWRC was conceived to function as the executing agency for any government-sponsored infrastructure development project required for the Kingston Waterfront area. These two Agencies, some thirty years ago, felt that a bridge across the harbour would be a very desirable element to be featured in their overall plan for revitalization and modernization of the downtown waterfront area of the capital city. So much so that in 1974 they commissioned one of the world's leading civil engineering consulting firms, Parsons Brinkerhoff, of New York, USA, to carry out studies and prepare a report concerning the technical and economic feasibility of a project for construction of a bridge spanning across from Breezy Castle to the old airport runway.

7.11.2 Parsons' 1974 report indicated that there would be no serious technical challenges to be overcome in construction of an appropriate bridge, but due to scarcity/lack of essential data, they were unable to give a definitive opinion as to the economic and financial viability of such a project.

7.11.3 In the report for Component A of this project which presents a Master Plan for development and zoning of the harbour, the consultants have included the concept of a cross-the-harbour bridge as a signature structure for the waterfront environment; and in December 2005, a public forum was hosted by the Jamaica Institution of Engineers which seemed to have drawn some favourable comments from important stakeholders. (See Appendix D).

7.11.4 However, it seems clear that the engineering concepts presented in Parsons' 1974 report need to be revised and up-dated to reflect current design criteria and developments in bridge technology which have evolved over the past thirty years.The Kingston Harbour Project Unit hereby advocates that consideration be given to the possibility of obtaining the necessary funds to engage suitable consultants to carry out an up-dated pre-feasibility study for the proposed Kingston Harbour bridge. Available data suggests that it might be extremely challenging to be able to formulate a project that would be justifiable on purely economic or financial grounds. Probably the most realistic scenario in relation to how the necessary funding for construction of a cross-the-harbour bridge might be realized, is to envisage a combination of international development bank financing from institutions such as IDB or CDB, with GOJ sovereign guarantee.

8. CONCLUSIONS & RECOMMENDATIONS

8.1 This project had two overriding objectives:

(1). To facilitate/formulate institutional arrangements best suited to coordinate the diverse stakeholders and activities that impact upon the current state of the harbour; and

(2). To support pre-investment efforts to address major pollutant sources.

The project files and the numerous reports produced over the past two-and-a-half years by the NEPA project team and the four teams of contracted consultants will show that steadfast efforts have been made to satisfactorily fullfill the above objectives. In this Final Report, the Kingston Harbour Project Unit has endeavoured to give a concise summary of the manner in which the project was executed, and pertinent descriptions of the significant Outputs that have been generated.

8.2 The Outputs were delivered directly to the Kingston Harbour Project Unit at NEPA, where the first reviews were done, and any necessary interactions conducted with the responsible contractors, until NEPA was satisfied that the product substantially fulfilled the requirements of the Terms of Reference. Secondly, having been accepted by NEPA, Outputs were presented to the Kingston Harbour Project Committee (KHPC) for comments, and only after approvals of the KHPC were obtained, were the products then submitted to IDB for the Bank's "no objection".
In view of the fact that all of the significant Outputs of the project have satisfactorily passed through each of the three review stages, it may reasonably be asserted that the project has fulfilled its objectives.

8.3 Some eleven issues were mentioned above as deserving urgent follow-on attention,in order to capitalize on the considerable momentum generated by this project towards the long-awaited clean-up of the Harbour. However, in view of the prevailing stringent national economic conditions, it is likely to be very challenging for government to be able to mobilize the necessary financial resources to allocate for implementation of all of the eleven projects identified; and therefore it will probably become necessary to prioritize.

The Project Unit would recommend that in such case, the following projects should be given highest priority, in the order listed:

(i). Finalization of the best-suited institutional framework for management of the harbour.

(ii). Final calibration of the water quality model.

(iii). Constitution of the Monitoring & Advisory Committee, (MAC), for KMA wastewater systems.

(iv). Study to evaluate the technical & economic feasibility of keeping Soapberry treated effluent on-shore for beneficial re-use.

(v). Further assistance to industries for implementation of EMS

(vi). Further initiatives towards implementation of a ship-waste reception facility for the port of Kingston.

Cowell Lyn	**Sheries Simpson**
Project Coordinator	Assistant Project Coordinator
February, 2006	February, 2006

APPENDICES