DRAFT

VISION 2030 JAMAICA

NATURAL RESOURCES AND ENVIRONMENTAL MANAGEMENT & HAZARD RISK REDUCTION AND CLIMATE CHANGE

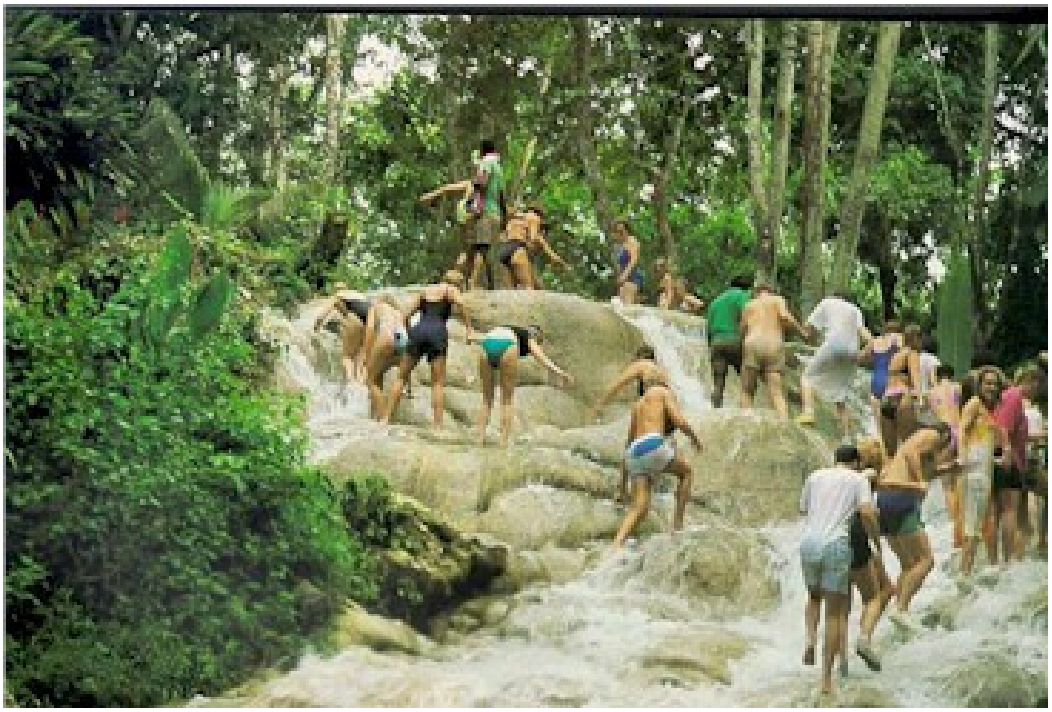
SECTOR PLAN 2009 - 2030

VISION 2030 JAMAICA: NATIONAL DEVELOPMENT PLAN

COMBINED SECTOR PLAN
NATURAL RESOURCES AND ENVIRONMENTAL MANAGEMENT &
HAZARD RISK REDUCTION AND CLIMATE CHANGE

Prepared by the Natural Resources and Environmental Management & the Hazard Risk Reduction and Climate Change Task Forces
July2009

Table of Contents



List of Acronyms

ADA	Association of Development Agencies
BOD	Biological Oxygen Demand
BSJ	Bureau of Standards, Jamaica
CBOs	Community Based Organizations
EPI	Environmental Performance Index
EVI	Environmental Vulnerability Index
EVI	Environmental Vulnerability Index
IOJ	Institute of Jamaica
IPCC	Intergovernmental Panel on Climate Change
ISCF	Island Special Constabulary Force
JaNEAP	Jamaica National Environmental Action Plan
JIE	Jamaica Institution of Engineers
JMA	Jamaica Manufacturers' Association
JNHT	Jamaica National Heritage Trust
JPS	Jamaica Public Service Company Limited
JTI	Jamaica Trade and Invest
LBS	Land Based Sources
MDAs	Ministries, Departments and Agencies
MDGs	Millennium Development Goals
Met Office	Meteorological Office
MOHE	Ministry of Health and Environment
MTF	Medium Term Socio-Economic Policy Framework
NCST	National Commission on Science and Technology
NDP	National Development Plan
NEEC	National Environmental Education Committee
NEPA	National Environment and Planning Agency
NGOs	Non-Governmental Organizations
NLA	National Land Agency
NPA	National Plan of Action
NRCA	Natural Resources Conservation Authority
NSWMA	National Solid Waste Management Authority
NWC	National Water Commission
OPM	Office of the Prime Minister
PCJ	Petroleum Corporation of Jamaica
PIOJ	Planning Institute of Jamaica
PM	Particulate Matter
PSMD	Public Sector Modernization Division, Cabinet Office
SDC	Social Development Commission
SIDS	Small Island Developing States
SWOT	Strengths, Weaknesses, Opportunities and Threats
T21	Threshold 21 Jamaica
UDC	Urban Development Corporation
UTECH	University of Technology
UWI	University of the West Indies
WRA	Water Resources Authority

Message from the Chairmen, Natural Resources and Environmental Management/Hazard Risk Reduction and Adaptation to Climate Change Task Forces

Chapter 1: Setting the Context

Introduction

Jamaica's economic development, livelihoods and patterns of settlement have been closely tied to the natural resource base of the island. In a relatively small area the island has an array of coastal and terrestrial resources, including tropical ecosystems, forests, dry limestone forests, scrub, coastal - etc. The description "land of wood and water" speaks to the forest cover and water resources, some of which have been degraded.

Natural resources of the land, air and water may be viewed as capital, providing essential services for economic and social development (See Table 1). The functions of a healthy environment such as nutrient cycling, flood control, climate control, soil productivity, forest health, pollination, waste assimilation and natural pest control underpin economic development and sustain human health. A healthy, natural environment is a fundamental basis for sustainable development and human survival.

Main Challenges - Jamaica's Natural Environment

Some of the main challenges being experienced in Jamaica's natural environment include:

- Proneness to natural and man-made hazards
- Inadequate incorporation of environmental issues into sectoral policies
- Inadequate emphasis on preventive maintenance
- Squatting
- Rapid urbanization
- Lack of support by citizenry and political directorate for sustainable development commitments
- Relevant agencies do not 'buy into' integrated approach to environmental management
- Inadequate financial resources
- Jamaica's location, geology and geography make the island prone to several natural hazards. The major threats include landslides, hurricanes, floods, droughts and earthquakes. These hazards when combined with situations of high vulnerability usually result in disasters of varying severity.

The economic and social well-being of Jamaica is directly linked to the state of its natural resources and the quality of the environment. The island's economic activities (tourism, mining etc.) if not undertaken in a sustainable manner, can negatively impact on the quality of the environment and natural resources. There is the need to consider resource utilization in more sustainable terms. Additionally, each of Jamaica's important economic sectors has significant environmental aspects and impacts. In spite of the interdependence between the Jamaican economy and the natural environment, there is

evidence of a tendency to undervalue natural capital. The result is lack of sustainable use of resources leading to resource depletion and environmental degradation.

TABLE 1: ECOSYSTEMS GOODS AND SERVICES

ECOSYSTEM	GOODS	SERVICES
Agro-ecosystem	• **Food Crops** • **Genetic resources**	• **Habitat** • **Build Soil Organic Matter** • **Carbon Sequestration** • **Employment**
Coastal and Marine Ecosystem	• **Fish & Shell Fish** • **Genetic resources**	• **Storm Moderation (mangroves)** • **Wildlife Habitat** • **Biodiversity Maintenance** • **Aesthetic enjoyment & recreation** • **Employment**
Forest Ecosystems	• **Timber** • **Fuelwood** • **Genetic resources** • **Drinking & Irrigation Water** • **Non-timber Products**	• **Pollution control, Oxygen Emission** • **Watershed Maintenance** • **Carbon Sequestration** • **Biodiversity Maintenance** • **Soil Production** • **Habitat** • **Employment** • **Aesthetic enjoyment & recreation**
Freshwater Ecosystem	• **Drinking & Irrigation Water** • **Food** • **Genetic resources**	• **Waste Assimilation** • **Habitat** • **Cycle nutrients** • **Transport corridor** • **Carbon Sequestration** • **Aesthetic enjoyment and recreation**

Although Jamaica has made substantial improvements in environmental management, many challenges still remain and need to be addressed. Recent evaluations of the state of the environment indicate that there is a number of worrying trends. Among these are: deteriorating air and water quality; poor management of solid, liquid and hazardous wastes; loss of biodiversity; watershed degradation and net loss of forests cover; and increasing incidence of fires.

The current state of the Jamaican environment is a concern for both state and non-state actors. Additionally, the many complexities and unique features of the Jamaican environment require a focus on strategies that can be utilized to ensure that the country's developmental objectives are compatible with the natural environment and in keeping with the tenets of sustainable development. In recognition of the importance of the aforementioned, many of government's sectoral policies over the past ten to twelve years, have reflected the importance of sustainability and seek to take into account social, environmental and economic factors. The main planning instrument for environmental conservation and sustainable development is the Jamaica National Environmental Action Plan (JANEAP).

Actions taken to fulfill human needs are increasingly being recognized to have local, regional and global environmental consequences. Jamaica situation is not unique to this, and as a result, tremendous time and effort is being spent on sensitizing and educating the population on issues related to the environment; improvements in existing legislation and the formulation of new policies. Actions geared towards sustainability are particularly important for a small island state such as Jamaica, as there is a close relationship between the ecological, economic and social systems.

Additionally, over the last two decades, natural hazards have had significant impact on economic activities, property, human welfare and natural resources. Between 1991 and 2005, six major events resulted in losses estimated at J$53.03 billion, an average of J$ 8.8 billion per event. Disasters have potentially significant implications for public finance, increasing expenditure, reducing domestic revenue and in turn resulting in increased domestic and external borrowing. There are few options to reduce the occurrence and intensity of most natural hazards. As such, greater emphasis needs to be placed on hazard risk management activities and programmes for reducing existing and future vulnerability to damage and loss. A natural hazard mitigation policy has been developed and approved by Cabinet. This policy however, needs to be complemented by an action plan. Among the more urgent priorities are hazard data collection and mapping, vulnerability assessment, risk assessment, watershed management and risk transfer measures such as parametric insurance.

Jamaica has initiated various policy responses to address environmental and planning issues – new policies, strategies and action plans, laws and regulations, and become party to several multilateral and regional environmental agreements. Notwithstanding, much of the problems hindering progress in the environment and sustainable development arena relate to the inadequate policy, legislative and institutional capacity in critical areas of the system. In addition to a number of general outdated legislation, a critical issue is the inadequate enforcement of existing legislation. Another issue is that relevant institutions involved in environmental management lack the capacity (financial, human, physical) to effectively execute their mandates and are unable to deal with the complex nature of current problems. Some of this is manifested in the level of post-permit and on-going monitoring and in the country's inability to effectively use market-based incentives or disincentives to improve environmental management.

Vision for the Sector

"We will work together to adopt and promote measures that will help develop a sustainable society, achieve and enhance a healthy natural environment in harmony with the social and economic aspirations of Jamaica".

This Sector Plan for Natural Resources and Environmental Management and Hazard Risk Reduction and Climate Change is premised on a vision shared by hundreds of Jamaicans on the state of the natural environment and the importance of protecting and preserving it and the important roles society can collectively play in shaping the planning process to 2030. Additionally, incorporated in this Sector Plan is a set of adaptation strategies to better enable Jamaica to cope with the impacts associated with climate change. Climate change is included in this context because of the many impacts that its effects can have on natural resources and consequently the state of the natural environment. Reducing disaster risk such as those that can be created by climate change and protecting the natural environment are complementary and often involve identical practices[1].

Integrating disaster risk reduction, climate change and environmental management is an

[1] Subsequent drafts will include a more fulsome discourse on hazards and climate change

appropriate method for addressing disaster as the integration is known to create many synergies, such as reducing the cost of implementing parallel programmes and activities.

This Plan is one of thirty-one chapters that would form the foundation for the development of Jamaica 2030 – a 21 year plan designed to put Jamaica in a position to achieve developed country status by 2030. Vision 2030 Jamaica is based on a fundamental vision to make ***'Jamaica the place of choice to live, work, raise families, and do business,'*** and on guiding principles which put 'people' at the centre of Jamaica's transformation.

The preparation of the Plan will be supported by a quantitative systems dynamics model – Threshold 21 (T21) Jamaica – which supports comprehensive, integrated planning that would enable the consideration of a broad range of interconnected factors along economic, social and environmental considerations and will be used to project future consequences of different strategies across a whole range of indicators. In addition, it will enable planners to trace causes of changes in any variable or indicator back to the assumptions.

The sector plan was developed using the following processes:

- Task Force Meetings and Working Group Meetings that were used to solicit ideas and views from members[2] on natural resources and environmental management issues and challenges facing Jamaica as well as identifying a vision for the sector, and determining key goals, outcomes, strategies and actions for the sector over the period 2008 to 2030
- A workshop that enabled the members to focus both on natural resources and environmental management issues as well as hazards and climate change
- Research on international best practices in natural resources and environmental management as well as climate change that could be adopted in the Jamaican context
- Strategic meetings of the working group, along with the chairs of the respective Task Forces

This document is structured in the following chapters:

- Chapter 1: Setting the Context
- Chapter 2: Situational Analysis

[2] See Appendix 1 for List of Members of the Natural Resources and Environmental Management Task Force, the Hazard Risk Reduction and Climate Change Task Force and the Working Group

- Chapter 3: SWOT Analysis
- Chapter 4: Strategic Vision and Planning Framework for the Natural Resources & Environmental Management and Hazard Risk Reduction and Climate Change Sector Plans
- Chapter 5: Implementation Framework and Action Plan for the Natural Resources & Environmental Management and Hazard Risk Reduction & Climate Change Sectors
- Appendices

Chapter 2: Situational Analysis

Jamaica's main economic activities tourism, mining, agriculture and fishing rely significantly on the country's rich natural resource-base. Notwithstanding, Jamaica's natural capital is showing signs of degradation. Coral reefs for example, are one of the foundations of the country's tourism industry (as well as protection of the island from storm surges) and present a protective barrier against storms and are sources of food, employment and recreation. However, Jamaica's coral reefs are in decline with mean coral cover at 10-meter depth[3] declining from 52% in the 1970s to 3% in the 1990s.[4]

Although Jamaica has made substantial improvements in environmental management, many challenges still remain and need to be addressed. Recent evaluations of the state of the environment indicate that there is a number of worrying trends. Among these are:

- deteriorating air and water quality
- poor management of solid, liquid and hazardous wastes
- loss of biodiversity
- watershed degradation
- net loss of forests cover
- increasing incidence of fires

Additionally, while data and analysis of environmental problems have improved in recent years, serious gaps and a lack of time series data hamper efforts to use quantitative indicators to spot emerging problems, assess policy options and gauge the effectiveness of environmental programmes.[5]

[3] Deeper reefs are in better condition – however, overall decline of reefs is a major concern
[4] Country Environmental Assessment for Jamaica 200, IDB
[5] 2008 Environmental Performance Index. World Economic Forum

A Snapshot of the State of Jamaica's Environment

Water Quality[6]

- 40% of groundwater sources are at risk from contamination from industrial effluents (sugar factory, distillery or alumina plants), sea water intrusion, or sewage
- All major river courses receive pollutants at some point from industrial waste, sewage, silt, debris and agricultural run-off. Most surface waters fail to meet the recreational water quality standard because of microbial organisms evidenced by high levels of coliform which indicate faecal contamination from humans or animals
- Approximately 85% of the population receives treated water

Air Quality

Direct releases to the air occur from various human activities as well as from natural processes. Some of these processes include: bauxite and alumina (accounting for 60% of sulphur oxide emissions and 55% of particulate matter emissions), and transport (accounting for 40% of nitrous oxide emissions)[7].

Forestry and Watershed Management

- Over 30% of Jamaica is classified as forest, of which 64% is unprotected (mainly privately owned and crown lands)
- >94% of all Jamaica's forests are disturbed and >20% of land within forest reserves has been impacted by human activity
- >1/3rd of all combined protected forest and other protected areas has been significantly disturbed

Land Use Pressures

Land use pressures are greatest in the coastal[8] and urban areas. Contributing factors include urbanization, population growth in vulnerable areas, limited availability of affordable and assessable land for low income owners, poor agricultural and forestry practices poorly managed development and human encroachment in forest reserves and protected areas. These land use pressures result in environmental degradation including exacerbation of erosion and flooding, degraded and diminishing wetlands, compromised water resources and deteriorating coral reefs.

Biodiversity

- Jamaica ranks fifth among the islands of the world with respect to endemic plants
- Jamaica has 822 endemic species of flowering plants (this represents 1/4 of total number of plant species)
- High level of endemism for many species of animals including snails, terrestrial grapsid crabs, amphibians, reptiles, and lands birds

Notwithstanding the current state of the natural environment, Jamaica ranked 54 out of 147 countries in the 2008 Environmental Performance Index (EPI)[9]. Jamaica outperformed countries such as the Netherlands (which placed 9th on the Human Development Index 2007 compared to Jamaica's position of 101) and along with the Dominican Republic, Cuba and Jamaica are the leaders in the Caribbean in

[6] Water Resources Development Master Plan (2000), Water Resources Authority.
[7] 1994 data.
[8] 62% of the population lives within 5km of the coast.
[9] Twenty-five environmental indicators build the index which centres on countries environmental performance. The EPI tracks actual results related to a core set of environmental issues that governments around the world have prioritized.

environmental protection and sustainability.[10,11]

The EPI "*provides a powerful tool for steering environmental investments, refining policy choices and understanding what drives policy outcomes."*[12] Some of the issues clearly emerging from the report on the environmental equation are that:

- Economic power doesn't automatically lead to a better environment
- Developed countries with significant financial resources for environmental management make up a large portion of the top performers suggesting that wealth is a major determinant of environmental success. However, at every level of development some counties achieve results that far exceed their peers demonstrating their policy choices in environmental issues. For example, Costa Rica which is a middle-income developing country and which ranks[5] in the EPI
- Top ranked countries have invested in water and air pollution control and other elements of environmental infrastructure and have adopted policy measures to mitigate the harms caused by economic activities," stated the report. Low-ranked countries generally have not made investments in environmental public health and have weak policy regimes

Over the past three decades in Jamaica, concern for environmental issues has greatly increased, and many new institutions, policies, legislation and standards have been put in place by the Government geared solely towards the proper management conservation and protection of the natural resources within the context of sustainable development.[13] However, the lack of resources, both financial and human, improper planning for development and the general lack of awareness on the part of the citizenry, manifested in unsustainable patterns of production and consumption and irresponsible environmental practices have hindered the effective conservation and management of the islands natural resources[14].

Impact of Some of Jamaica's Socioeconomic Sectors on the Natural Environment

There exists a high level of interdependence between the environment and economic and social systems in Small Island Developing States (SIDS) such as Jamaica. Natural

[10] 'Greener days' in Jamaica by Tony Best Published on: 1/30/08 in the Trinidad Guardian Newspaper.
[11] The EPI has two overarching objectives: reducing environmental stresses on human health; and promoting ecosystem vitality and sound natural resource management.
[12] 2008 Environmental Performance Index. World Economic Forum.
[13] "Jamaica's Commitment to the Conservation and Management of Natural Resources: Ten Years in Retrospect" (2002). Laleta Davis Mattis, NEPA.
[14] Jamaica National Environnemental Action Plan (JANEAP) 2006 – 2009. National Environment and Planning Agency.

resources have played and continue to play an important role in Jamaica's development. The island's major economic sectors, agriculture, tourism and mining, are all based on the natural resources found in Jamaica.

Tourism - Environmental Impacts

There are several negative environmental impacts associated with the growth in tourism. These include: the concentration of infrastructure along narrow coastal zone, destruction of wetlands and mangrove to facilitate hotel construction and erection of piers and marinas. In addition, there is the destruction of marine habitat due to dredging, sea grass removal, damage to coral reefs and discharge of sewage into off-shore areas.

Thus, whilst the phenomenal growth of this industry presents many attractive opportunities as it can generate substantial wealth, it also presents a challenge as the country continues to struggle to maintain competitiveness and ensure sustainability of the industry itself and the physical environment. It is generally agreed that is it the environmental quality of a destination that determines the success of its tourism industry/product as the natural environment is usually the main attraction for tourists. When carefully planned and managed, tourism can both conserve the environmental and cultural heritage of an area[15].

Mining and Quarrying -Environmental Impacts

While bauxite generates a very important contribution to the economy, mining and processing of the ore as well as port operations have not been without environmental challenges. Mining and quarrying activities have had numerous negative environmental impacts. These include: dust and noise pollution; relocation of communities; deforestation; loss of biodiversity; land and groundwater pollution from red mud disposal; scarification of the landscape and beach erosion. Roof damage associated with emissions of sulphur dioxide has led to compensation agreements with several communities in the bauxite area. The quarrying of industrial minerals has environmental impacts similar to those of bauxite mining.

[15] Tourism, Manufacturing and the Environment: Exploring the Linkages. (2005) ENACT Programme and the Jamaica Manufacturers Association Limited.

The challenge for the mineral sector locally, is to move away from just addressing environmental and community issues after they have emerged, to addressing the big picture of the sustainability of its processes and products (from exploration through to smelting and refining) socially, economically and environmentally for all the communities and countries in which it operates[16].

Manufacturing and Industrial Processing – Environmental Impacts

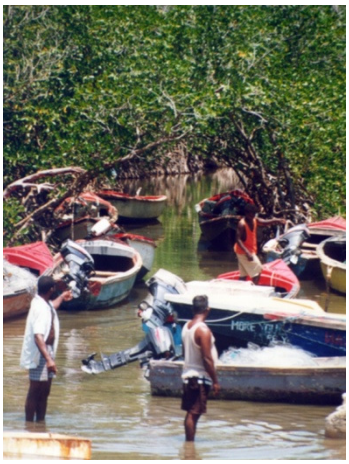
Manufacturing and industrial processing have negatively affected water quality both in rivers and in places such as the Kingston Harbour. This is primarily due to effluent (sewage and trade) discharge in these bodies, increasing biological oxygen demand (BOD). Some activities have generated fugitive dust e.g. cement manufacturing and others have affected air quality via burning of fossil fuel e.g. JPS power plants. Further, there are cases of noxious odours associated with alumina processing (smell of caustic soda) and ethanol manufacture. The generation of hazardous waste as well as noise are negative environmental impacts also associated with the sector.

Agricultural-Environmental Impacts

The major impacts arising from agriculture include: soil erosion; excessive land clearing; uncontrolled use of fire; loss of biodiversity and wildlife habitat. In addition, the use of agro-chemicals such as fertilizers, pesticides and weedicides and run-off have adversely affected water quality in many locations. There are places along the south coast of Jamaica where there is saline intrusion due to over-abstraction of water from coastal aquifers for irrigation.

[16] "Sustainable Development for the Minerals Industry", 2007. Ministry of Energy, Mining and Telecommunications, Management Institute for National Development, ENACT Programme.

Fishing- Environmental Impacts



Fishermen in Black River, St. Elizabeth

Fishing has historically played an important role in the economic, social and cultural life of Jamaica. The state of fisheries also can be used as a proxy indicator for the overall health of marine environments. Overfishing, habitat destruction and use of dynamite have negative environmental impacts on Jamaica's fisheries. There is no practice of returning juvenile fish to the wild. Use of fine mesh nets and dragline method of fishing also has a negative impact. In addition, there is fishing for conch and lobsters during the respective closed seasons adversely affecting future catches. Notwithstanding, the Environmental Performance Index gives Jamaica a high ranking of 92.3 indicating that the country's fishery is sustainable.

Forestry Environmental Impacts

The extraction and utilization of forest resources have resulted in deforestation, habitat destruction and soil erosion. Many natural and plantation forests are usually located within the upper reaches of watersheds. The removal of trees has been affecting low-lying areas, resulting in increased flooding, sedimentation and reduction in aquifer recharge.

Situational Analysis – Overview [17]

The Situational Analysis presented here represents an overview of the state of the natural environment and is structured accordingly:

- Part 1 - Information on the Jamaica's natural habitats and environmental resources (location, area etc.), the state of these habitats, issues and challenges related to the habitats and governance/management issues related to each of the habitats
- Part 2 – A brief discussion on the possible impacts of climate change on Jamaica

PART 1 – STATE OF JAMAICA'S NATURAL HABITATS			
Ecosystems	**Key Issues and Challenges & Threats – Related to the Ecosystem Itself**	**Management and Policy Issues**	**Other Information**
Coastal Zone	• Fish catches are being reduced by over exploitation • Coastal mangroves, wetlands and seagrass beds which provide breeding, feeding and • Nursery grounds for fish and shrimp are being destroyed • Lack of awareness, resources and expertise, has resulted in insufficient research on various matters associated with ocean and coastal management i.e. fisheries, coastal ecosystem, mitigation of non-point source of pollution and sea-bed mining	• Since 1998, progress is being made in developing broadly adapted management plans for the ocean and coastal zone • An inventory of marine and coastal resources and conditions has been completed (started in 1995) and will provide baseline information for coastal zone management and development decisions. • A coastal zone resource atlas, as well as a working computerized Geographic Information System database, exists • Marine protected areas exists, with three of these being classified as marine parks while the other two include both land and marine areas. • A National Programme of Action (NPA) to address Land-Based Activities and Sources (LBS/LBA)of marine and coastal degradation exists and provides an	The nature of the Jamaica's coastline has given rise to the formation of a unique ecosystem of harbours, sandy beaches, rocky shores, estuaries, wetlands, and coral reefs. To a large extent the country's major cities and towns have developed along the coastline including the capital city Kingston which sits on the seventh largest natural harbour in the world and the major tourism towns of Montego Bay, Ocho Rios, Negril and Port Antonio, all of which lay along the coastline.

[17] A full situational analysis on natural resources and environmental has already been prepared and is available from the PIOJ

PART 1 – STATE OF JAMAICA'S NATURAL HABITATS			
		integrated management framework that enables all relevant national and local actors to reduce environmental degradation and habitat damage	
Beaches	• Beach Erosion – two main causes: natural and man-made causes • Illegal sand mining is a longstanding problem and continues due to the lack of enforcement • Recreational coastal and marine water quality is influenced by several factors including the discharge of sewage and industrial effluent into the coastal and marine waters, non-point source discharges from agricultural activities, urban runoff and modifications of natural systems (including the destruction of wetlands), urbanization and the growth of informal settlements in coastal areas. • Water sports, boating, yachting, fishing and commercial shipping activities generate and discharge wastes into the near shore waters. • Solid waste washed up or dumped on bathing beaches is a constant problem. Solid waste is derived from many sources including illegal dumping from ships at sea; waste from urban and agricultural environments washed down in rivers or storm gullies and then carried by inshore currents towards the beaches; wind driven wastes; and negligence by users of the beach.	• Tourist developments, primarily hotels and resorts along the coastal strip, have left fewer good beaches available for public use. • There exists few operational public bathing beaches and commercial recreational beaches. • There is little documentation on the ownership, size and boundaries of most of the fishing beaches. As a result, conflicts have arisen between fishing groups and other beach users such as hoteliers and property developers. • Unregulated development of infrastructure on fishing beaches, often results in shanty villages with poor liquid and solid waste disposal practices. • The Beach Control Act regulates rights to the foreshore and the floor of the sea in Jamaican waters. Provisions contained in the Act govern commercial and recreational activities; the control and management of development on the beach through licensing provisions and the protection of the marine ecosystem. • A National Beach Policy for the	Jamaica's beaches are among the most important natural resources to the economy. The beaches of Jamaica are of international renown, and are one of the main factors contributing to the growth and success of the island's tourist industry. Fishing beaches are relatively evenly distributed along the coast. There are eighty-seven (87) public recreational beaches used by the public for bathing, of which eighteen (18) are commercial recreational beaches. There are two hundred and seventy-five beaches associated with guest houses and villas, sixty (61) bathing beaches associated with hotels , and one hundred and twenty-one (121) fishing beaches.

PART 1 – STATE OF JAMAICA'S NATURAL HABITATS			
	• Squatting is a major problem at fishing beaches.	Management of the Beach, Foreshore, Floor of the Sea exists but needs to be promulgated to effectively guide and provide the framework for the management of beaches in Jamaica. Additonally, a Jamaica Coral Reef Action Plan and Coral Reef Policy has been prepared and a National Policy for the Conservation of Seagrasses has also been drafted and complements the goals and objectives of the coral reef and the beach policies.	
Wetlands	• Coastal wetlands are increasingly threatened by infrastructure development and conversion from natural habitat to other uses. • Conversion of large tracts of coastal wetlands, particularly mangroves, for commercial uses. • Widening and deepening wetland rivers has reduced the ecological value of these areas by slowing the run-off of floodwaters. This has led to an increase in peak fresh water flows to coastal areas contributing to the death of coral reefs. • Draining land for agriculture has caused wetland destruction. • Reclaiming of land • Climate change • Fires - wetlands are also destroyed by fires some of which are spontaneous, while some are deliberately set by humans.	• No overarching and coherent policy framework exists for wetland management . A mangrove and coastal wetlands protection policy was drafted by NRCA from as far back as 1996, but still remains in draft and awaiting completion. • Wetland management in Jamaica is complicated by the fact that most wetlands are on private lands and the constitution allows private landowners great latitude in the use and disposal of their property. • The level of wetland modification approved by NEPA is a concern being expressed by various civil society groupings.	Wetlands at one time comprised as much as 2% of Jamaica's total surface area. Today the area covered by wetlands have been reduced significantly, due primarily to land filling and modifications made to the natural drainage regime in some locations. It is estimated that Jamaica has lost approximately 30% of the island's mangrove forests; currently an area of 106 sq.km is still covered in mangroves.

PART 1 – STATE OF JAMAICA'S NATURAL HABITATS			
	• Pollutants – pollutants directly affecting wetlands include garbage, sewage, industrial waste (mainly from sugar factories), and oil spills. • Non-point source pollution by agro-chemicals, nutrients, and other materials used in agriculture • Large scale pumping from coastal aquifers, which affects the water balance inducing saltwater intrusion		
Coral Reefs	• In the last 35 years, there has been a preceipitous drop in coral cover around the island. • Coral diseases & Coral bleaching • Storm/hurricane damage • Excessive nutrients from sewage pollution • Siltation and poor watershed management practices • Over-fishing and indiscriminate fishing practices • Inappropriate recreational practices • Coastal Pollution • Death of Sea-Urchin – the 1983 mass mortality of the sea urchin (Diadema), an important species in the control algae resulted in significant coral damage as reefs became clogged by algal overgrowth.	• A draft Coral Reef Protection and Preservation Policy (1997) exists which sets out the framework for the management of the island's reefs. This policy also supports the International Coral Reef Initiative – Call to Action and Framework for Action. These policies remain in draft form. • Need to ensure that an effective management framework for coral reefs are put in place in light of their vulnerability to the effects of climate change and natural disasters.	Jamaican reefs have high value because of their high biodiversity and role in fisheries, tourism and shoreline protection. Thus, in addition to their ecological importance, Jamaica's coral reefs have high socio-economic, cultural and educational value, providing a range of invaluable products and services.
Fisheries	• Data on the fishing industry is collected irregularly and there are many discrepancies among the various sources.	• The Fishing Industry Act - The object of the Act is to manage the fisheries resources of Jamaica. The Act, however, has not kept	Jamaican fisheries are made up largely of artisanal fishermen operating from open canoe type

PART 1 – STATE OF JAMAICA'S NATURAL HABITATS			
	• The inshore fishery is considered to be severely overexploited • The fishery on the Pedro and Morant banks are partially exploited, considered to be at, or near their estimated sustainable yield with respect to lobster and conch • Loss of habitat for fish due to coastal degradation and pollution • Use of destructive fishing gear • Lack of awareness by fishermen on fisheries management issues • Poaching by foreign fishing vessels • Fishers not respecting closed seasons and other fisheries regulations • Lack of adequate enforcement	pace with the evolution of fishing and the attendant resource management issues, and in this regard, a new Act which will provide an institutional framework for the management, planning, development and conservation of fisheries resources in Jamaica is scheduled to be passed soon.	boats powered by either outboard motors or oars. A small number of fishermen, but economically significant, are engaged in industrial fishing (mainly on the Pedro Bank) for conch, spiny lobster and reef fish. There is also a small commercial sport fishery associated with tourism and a small recreational fishery.
Forest Ecosystems	• In recent years, deforestation has led to the deterioration of more than a third of Jamaica's watersheds, drying up streams and rivers • Sixty-four per cent (64%) of Jamaica's forests are unprotected, are under private ownership or are Crown Lands. • Jamaica's forest cover has been under serious pressure for the production of yam sticks, charcoal, resort and residential development, timber extraction, grazing, and cropping. The lack of soil and water conservation measures has led to high rates of soil erosion, loss of nutrients, and reduction of water retention capacity in watersheds. Improper road construction and	• The last assessment of forest cover in Jamaica was undertaken in 1998. • There currently exists a Forestry Policy (2001) which sets out the framework for the conservation and protection of forests.	About 30 percent of Jamaica, approximately 336,000 hectares, is classified as forest. Jamaica's forests are considered to be a major repository of biodiversity, especially endemic flora and fauna.

PART 1 – STATE OF JAMAICA'S NATURAL HABITATS			
	logging operations, both legal and illegal, in pine plantations, have also contributed to the problem. • The majority of forest land has been disturbed and degraded, and only about 8 percent of the island remains as natural forest showing little evidence of human disturbance. Forests are threatened by industrial, agricultural and urban development. • Bauxite Mining - the Forestry Department has stated that bauxite mining is the single largest cause of deforestation in Jamaica. In 50 years of operation, the industry has stripped 5,099 hectares of trees, including some 3,218 hectares of forest.		
Watersheds	• Each of Jamaica's 26 watershed management units has portions considered to be degraded, while 10 of these units are considered severely degraded. • Reduced tree and vegetative cover and productivity of land • Heavy siltation of rivers, reservoirs, irrigation canals, water intakes, beaches and harbours • Increased surface runoff (due to excavation of slopes, diminished vegetation cover, compacted soils) • Reduced storage and availability of water • Severe flooding, especially during the hurricane season resulting in considerable losses in life, agricultural crops and other property and	• Unsuitable farming practices such as over-cultivation of steep slopes has long been recognized as the single most important cause of the degradation of watersheds in Jamaica. • Large scale removal of trees from watershed areas, illegal mining, unapproved and informal quarrying of sand and limestone, housing programmes and squatter settlements has contributed to the high rate of deforestation. • Trees are cut for fuel wood and charcoal production, yam sticks and lumber and the problem is aggravated by forest fires that occur during extended periods of drought. • The 26 watershed management units needing	

PART 1 – STATE OF JAMAICA'S NATURAL HABITATS			
	damage to roads • Increased marine and coastal contamination and degradation adversely affecting recreational tourism and economic use of beaches and the coastal zone • Loss of habitat for important flora for fauna	urgent remedial work to bring them back to an acceptable state of health. This needs to be done to improve the availability and quality of water. • The Watershed Protection Act provides a framework for the management of watersheds in Jamaica. The 26 watershed management units are declared under the Act.	
Biodiversity and Biological Resources	• 14 animal and endemic species and over 200 plant endemic species are classified as critically imperiled or especially vulnerable to extinction. • Deforestation, wetland destruction and coral reef degradation have resulted in both the reduction and loss of biodiversity • Population growth, coupled with agricultural, industrial and commercial expansion, has resulted in intense competition for land. • Awareness by the general public and public sector entities on the importance of biodiversity is limited and in many instances, biodiversity issues are not infused into national and sectoral policies • Poverty and over-consumption by certain sectors of the society are contributing to the decline in biological resources – for example, the communities closest to the most vulnerable biological resources are among the country's	• Jamaica's current environmental legislation provides a basic framework for the conservation and sustainable use of biodiversity. There are at least 52 pieces of legislation which have aspects that directly relate to the management of the environment. However, very few of these statutes deal comprehensively with the protection, conservation and sustainable use of biodiversity, as they are primarily sectoral in nature. • The Wild Life Protection Act is the only statute[18] in Jamaica that specifically protects designated species of animals and regulates hunting in Jamaica. • The Convention on Biological Diversity creates the framework for Parties to implement national legislative, policy and administrative measures.	Jamaica has a high level of plant endemism and has been rated fifth among islands of the world for its endemic plants. Jamaica also has high levels of endemism for many species of animals such as snails, crabs, amphibians, reptiles and land birds.

[18] National Strategy and Action Plan on Biodiversity in Jamaica

PART 1 – STATE OF JAMAICA'S NATURAL HABITATS			
	poorest.	• The status of the island's biological resources need to be accurately quantified. Whilst data is available on some species, there exists limited data on the lower plant orders. • Whilst the introduction of exotic species is regulated, there still exist concerns about accidental introduction of species. • Greater efforts need to be made to understand the intrinsic and economic values of the country's biological resources.	
Parks and Protected Areas	• Currently, public understanding of the benefits from conservation and protection is insufficient • Inadequate financing to apply conservation and protection management in protected areas • Accessing financial resources to undertake assessments in order to determine the status of many of the 100 areas that are scheduled to be declared as protected areas, and putting into place interim measures to ensure their conservation	• A policy framework exists for the National System of Protected Areas. This policy document is entitled, "Policy for Jamaica's System of Protected Areas". • Marine and national parks provide managers with an opportunity to control activities likely to impact negatively on the resources within national parks • Government and non-governmental organizations have been involved in the management of protected areas • A new five-year management Plan was developed Blue and John Crow Mountain National Park. The main purpose of the Plan is to guide the management of the national park around two main areas of focus: the conservation of plants and wildlife; and, the provision of nature-based recreational opportunities by all its co-management	The value of protected areas has been recognized internationally. Whilst protected areas cannot cure all environmental ills, when effectively managed, they conserve biodiversity, protect watersheds and coastlines, assist in flood control, groundwater recharge, habitat protection, provide clean water, food, medicinal plants, economic benefits in and around protected areas as well as recreational and educational opportunities.

PART 1 – STATE OF JAMAICA'S NATURAL HABITATS			
		partners. • A National Park Trust exists; however, it does not have the necessary capital to provide funding for all parks and protected areas presently declared. • User Fees Regulations are currently being developed for all national parks.	
Freshwater Ecosystems	• Seawater/saltwater intrusion of coastal aquifers caused by over-pumping of the aquifer, pumping below sea level and poor well design. The intrusion caused by over-pumping of wells is common particularly near densely populated areas where the groundwater is oftentimes affected by improper or inadequate sewage disposal and wastewater treatment. • The quality of water found in many of Jamaica's rivers is threatened, due to overburdening with wastes.[19] Discharges from the agricultural, industrial and mining contribute significantly to water pollution. • Caustic soda contamination "red mud" of ground and surface water from bauxite alumina plants – the ponding of these caustic wastes has leached sodium into underground water systems and has contaminated surface water resources. • Contamination of groundwater by seepage from		Sources of freshwater in Jamaica are: ▪ Surface water: rivers and streams ▪ Groundwater: wells and springs ▪ Rainwater harvesting Groundwater is the most important source of freshwater, accounting for 84% of the available fresh water resources. Jamaica's surface water resources account for approximately 16% of total water resources.

[19] U.S. Army Corps of Engineers, 2001, Water Resources Assessment of Jamaica, <www.sam.usace.army.mil>

PART 1 – STATE OF JAMAICA'S NATURAL HABITATS			
	unlined waste disposal sites and leaking underground petroleum storage tanks • Organic and bacteriological contamination of groundwater caused by seepage from soak-away pits for sewage disposal • Poor land use and inappropriate construction practices which lead to a flow reduction in some rivers, increased erosion and higher levels of turbidity in streams.		

Part 2 – Hazards and Climate Change

The number and seriousness of disasters is increasing, disproportionately affecting poor countries and poor communities. The recorded numbers of disasters, the number of people they affect and the property losses they cause, have risen dramatically each decade since reliable records began in around 1960. While no country in the world is entirely safe, the lack of capacity to limit the impact of hazards remains a major burden for developing countries, where over 90 per cent of natural disasters fatalities occur[20]. Natural disasters also pose a significant threat to prospects for achieving the Millennium Development Goals, in particular the overarching target of halving extreme poverty by 2015.

Disaster risk reduction entails measures to curb disaster losses by addressing hazards and people's vulnerability to them. Good disaster risk reduction happens well before disasters strike, but also continues after a disaster, building resilience to future hazards.

Hazards come in all shapes and sizes and some are partly human-induced, such as storms or droughts, many being influenced by global warming or landslides caused by deforestation. 'Natural' hazards cannot be considered in isolation from other hazard types. Natural hazards and their interactions with epidemics (especially HIV/AIDS), human impacts on the environment, including 'technological'[21] hazards, and conflict are also of critical importance. In addition to natural hazards, Jamaica is exposed to anthropogenic and technological risks related to the transportation sector and its proximity to sea lanes through which significant volumes of hazardous cargo pass (for example in the Kingston Harbour)[22].

Jamaica's location, geology and geography make the island prone to several natural hazards. The major threats include landslides, hurricanes, floods[23], droughts and earthquakes. The country is also located in the most likely path of tropical storms and hurricanes in the region. It is also geologically situated within a seismically active area of the Caribbean plate, making it vulnerable to earthquakes. Approximately 82% of the

[20] Living with Risk: A Global Review of Disaster Reduction Initiatives

[21] Technological hazards often result in major accidents associated with industrialization and technological innovation. The adverse effects of some technological hazards, both on society and on the environment can considerably outlast impacts associated with natural hazards.

[22] Jamaica National Assessment Report: A Ten Year Review of the Implementation of the 1994 Barbados Programme of Action for the Sustainable Development of Small Island Developing States. 2005. Ministry of Land and Environment

[23] Floods in the country due to high intensity rainfall is exacerbated by human activities – e.g. poor land use, unauthorized or ill-informed construction in river beds/flood prone area, blocked drains. Flooding is a frequent event resulting not only in economic losses (damaged infrastructure and crops) but also in increased pollutant loading reaching coastal areas.

population lives along the coastline, where the major cities and towns are located; consequently, coastal hazards have significant impact on the social and economic well being of the country. Some of the largest losses of life have been associated with storm surge, occasionally reaching heights of 20 to 30 feet at the coastline. Additionally, Jamaica's reefs and beaches have been adversely affected by storm surges[24].

The vulnerability of Jamaica is increasing, with a number of factors leading to this increase:

- Increased development in marginal (high risk) areas
- Inadequate efforts to mitigate the effects of hazards
- Anticipated increase in the occurrences of extreme events due to climate change

Population growth, uncontrolled urbanization and rural and urban poverty have resulted in the development of unplanned settlements in marginal and environmentally sensitive lands (flood plains and unstable slopes). This pervasive situation has continued almost unchecked for the last sixty years or so due to inadequate planning and environmental management (enforcement of existing legislation), the lack of appropriate institutional, legislative arrangements and political will. This has resulted in increased vulnerability particularly of the poor.

While there is now significant evidence to show that flawed development actually increases the incidence of "natural disasters". Lack of building regulations and physical planning codes, widespread lack of compliance with them, and/or uncontrolled market forces as the only arbitrator of economic development can all contribute to, exacerbate, or actually cause disasters[25].

MACROECONOMIC EFFECTS OF NATURAL DISASTERS

- Declines in overall and sectoral GDP
- Adverse impact on public finances
- Deterioration in the balance of payments (BOP)
- Inflation and depreciation pressures

Over the past 300 years, most of the destruction of life and property from natural hazards (hurricanes, storm surges, coastal flooding, river overflows) has taken place along many of the island's coastal areas[26]. These hazards

[24] Country Environmental Assessment for Jamaica. 2007, IDB

[25] CUBA Weathering the Storm: Lessons in Risk Reduction from Cuba. 2004. Oxfam America

[26] Natural Hazard Management in Urban Coastal Areas, 2007, IDB

when combined with situations of high vulnerability usually result in disasters of varying severity. Over the last 25-30 years Jamaica has experienced an increase in the frequency of natural events, primarily floods (related to inclement weather, tropical depressions, tropical storms, hurricanes), droughts and landslides.

Over the last two decades, natural hazards have had significant impact on economic activities, property, human welfare and natural resources. Between 1991 and 2005, six major events resulted in losses estimated at J$53.03 billion, an average of US$ 8.8 billion per event. Disasters have potentially significant implications for public finance, increasing expenditure, reducing domestic revenue and in turn resulting in increased domestic and external borrowing.

While hazards do happen, disasters do not just happen – to a large extent, they result from failures of development which increase vulnerability to hazard events. Disasters have macroeconomic impacts, directly through physical damage to infrastructure, productive capital and stocks, but also indirectly and in the longer term by affecting productivity, growth and macroeconomic performance. The occurrences of disasters must be of concern to small islands and economies such as Jamaica, as a single disaster is capable of interrupting the development process and the entire economy.[27]

Disasters can be reduced, and in some instances even prevented, by supporting people's ability to resist hazard impacts, by reducing human vulnerability. Vulnerability results from people's exposure to hazards and their susceptibility to hazard impacts. It reflects social, economic, political, psychological and environmental variables, shaped by dynamic pressures such as urbanisation. Environmental degradation, natural disasters and vulnerability are all linked.

The converse of vulnerability is capacity to anticipate, cope with, resist and recover from hazard impacts. A vulnerability index for the natural environment (EVI)[28] ranks Jamaica as extremely vulnerable, with a ranking of 381 [29] with the indicators in the text box below contributing most to the high vulnerability score.

[27] Volume 1, Section 3, Hazard Mitigation: Guidelines for Development in High Risk Areas, ODPEM
[28] Developed by the South Pacific Applied Geoscience Commission (SOPAC) and UNEP.
[29] Environmental Vulnerability Index

The "Disaster" Equation

Risk = Hazard x Vulnerability

Communities throughout the island are located in vulnerable areas whether in flood plains, on steep unstable slopes or along coastline where they are vulnerable to storm surges. The Rio Grande Valley in Portland has a history of flooding and communities along the course of the Rio Grande River such as Fellowship, Berridale, and Windsor are repeatedly flooded. Urban communities such as Caribbean Terrace have been impacted by storm surges and rural ones such as Portland Cottage have also been impacted. The Jacks Hill community generally has a high vulnerability to landslides and has experienced landslides triggered by earthquake, intense rainfall or other trigger mechanisms[30].

Figure 1: Community in Vulnerable Area

Landslides also cause significant damage to the country on an annual basis. The mountainous topography of the island coupled with its susceptible geology contributes to the numerous landslide occurrences which block roads and damage infrastructure. Poor land use practices and deforestation render slopes vulnerable to landslides. Some areas, because of factors such as topography and geology are naturally vulnerable to such occurrences. These areas include Jacks Hill in St. Andrew and Askenish in Hanover.

Several initiatives, projects and mitigation measures aimed at strengthening disaster management have been implemented to reduce the impact of natural hazards. Some of these include:

[30] "State of the Environment Report: A Disaster Management Perspective". Office of Disaster and Emergency Management, Jamaica

- Development of a draft hazard mitigation policy
- Incorporation of hazard information into the development approval process
- Relocation of communities located in high risk areas
- Strengthening the public education component of disaster management to focus more on the link between the environment and disasters
- Rio Grande Valley Flood Early Warning System
- Support to Community Based Disaster Management
- Disaster Mitigation Project for St. Mary
- Community Disaster Management Strengthening Project

Thus, there are few options to reduce the occurrence and intensity of most natural hazards. As such greater emphasis needs to be placed on hazard risk management activities and programmes for reducing existing and future vulnerability to damage and loss. A natural hazard mitigation policy was developed and approved by Cabinet in 2006. Among the more urgent priorities are hazard data collection and mapping, vulnerability assessment, risk assessment, watershed management and risk transfer measures such as insurance.

Climate Change

Small island and coastal nations of the world such as Jamaica have long been recognized as being among the most likely to be affected by the potential impacts of global climate change. The inextricable linkage between climate change and disaster management emerges from the potential of the former to result in an increased frequency and severity of hydro-meteorological hazards and the associated increase in risk faced by countries as a whole and by vulnerable communities in particular. For Jamaica, the most visible of these impacts has been the increasing vulnerability to severe storms such as Hurricanes, Dean (2005) and Ivan (2004) and the increased frequency and intensity of flood events.

Projected Climate Change Effects for the Caribbean 2050 (IPCC)

- A 1.5-2 °C increase in temperature;
- Subsequent increase in evaporation losses;
- Decreased precipitation – continuation of a trend of rainfall decline observed in some parts of the region;
- Projections by 2050 for the length of the rainy season – down by 7-8%;
- Projections by 2050 for the length of the dry season – up by 6-8%;
- Increased frequency of intense rains – up an average of 3% and projected
- to increase to 20% by 2050;
- Increased erosion and contamination of coastal areas;
- Sea Level Rise – median projection 40 cm by 2080 – causing increased
- salt water intrusion, augmented by storm surges;
- Strongest hurricanes more intense, increasing disaster losses;
- General increase in extreme events – droughts, floods; and
- Increased intensity of heavy rain events – rapid run-off/flash floods, causing soil
- Erosion, run-off of contaminants, and adverse effects on coastal waters.

Hazard impacts resulting from climate variability have exposed the vulnerability of key economic sectors: tourism, agriculture, fisheries, and water resources. These identified vulnerabilities are further exacerbated by human activities such as settlement patterns, land use, economic activities and poor policy development and management. Additionally, the impacts of climate change are magnified by abuse of the natural environment – for example, the destruction or inappropriate use and management of natural resources. This abuse is rarely due to the activities of poor communities, but moreso to large 'mega projects', illegal logging and deforestation, over-fishing, mining, and in some cases governmental neglect. But because of this environmental damage it is

much more difficult for poor communities to cope with climate change.

Climate change is considered to be the most pervasive and truly global of all issues affecting humanity and poses a serious threat to the environment as well as to economies and societies. Possible impacts of climate change on Jamaica include:

- Sea-level rise – climate change is expected to cause a rise in sea levels by about 20cm by the year 2030. Melting ice is responsible for a significant portion of the observed sea level rise globally, with the Greenland and Antarctic ice sheets being the largest contributors. In Jamaica sea-level rise is expected to compound beach erosion and cause permanent inundation in some areas.
- Declines in agriculture yields – rising sea level is expected to increase the potential for the flooding of farmland and increase the sodium chloride content of coastal groundwater. The IPCC predicts declines in grain yields of between 10 and 15% the Caribbean over the next 50 years, due to increased rainfall and desertification. This could result in one in eight persons being susceptible to famine.
- Severe repercussions on the tourist industry accelerating erosion and flooding, causing loss of beach, loss of amenity value and infrastructural damage to name a few. Climate change may have already affected Jamaica's reefs. The death of large numbers of corals in 1988 and 1990 have been attributed to the increase in temperatures of coastal waters

Thus, for Jamaica which depends heavily on tourism and agriculture for their livelihoods, these impacts could be ruinous.

In conclusion therefore, a healthy environment enhances society's disaster resilience in two ways:

- It reduces the impact of natural and human-induced disasters and it naturally mitigates against events
- Conversely, environmental degradation increases disaster risk from landslides, tsunamis, floods, droughts and other hazards. For example, natural resources management measures such as protecting soils from erosion and eventual desertification through sustainable farming reduce people's vulnerability to drought and flood.

Chapter 3: SWOT Analysis

This SWOT Analysis presents a review and analysis of the state of Jamaica's natural environment, but focuses on some of the legislative and resources issues that are resulting in the environmental issues the country faces. This SWOT methodology provided one framework for identifying goals, objectives and strategies and integrating them in the overall sector plan.

The SWOT Analysis for natural resources and environmental management presented below is structured around the following 5 thematic areas:

1. Legislative Framework
2. Institutional Framework
3. Capacity and Resources
4. Policy
5. Physical/Social Issues

The SWOT is specific to natural resources and environmental management issues only.

	Legislative Framework	**Institutional Framework**	**Capacity and Resources**	**Policy Framework**	**Physical/Social Issues**
Strengths	• Party to several international conventions which enables us to access funding for environmental programmes	• Increased media coverage has generated interest in environmental issues by the general public	• Availability of technically qualified environmental professionals		• Rich biodiversity, abundant natural beauty and natural resources (e.g. freshwater resources)
Weaknesses	Outdated laws, national physical plan	• Inadequate institutional coordination leads to	• Unavailability of good quality data	• Political influence results in high	•

	Legislative Framework	Institutional Framework	Capacity and Resources	Policy Framework	Physical/Social Issues
	etc.	policy incoherence, lack of common standards, policy gaps, lack of implementation of policy and lack of infusion of environmental issues into sectoral policies • Key institutions are ineffective in the delivery of their mandates • Local Government multiplicity of laws which inhibit holistic application - • Lack of accountability in key institutions • Inadequate system for monitoring the environment, no culture of enforcement, roles and responsibilities not well defined, oftentimes resulting in agency conflict and overlap	and information (for ecosystems and natural hazards) hinders scientific rigour in policy development, including investment policies • Lack of information on carrying capacity in critical areas • Low levels of funding allocated (budgetary support) in the national budget for environmental and natural resources • NGO sector disorganized and lack financial sustainability	level decisions being made in isolation of planning framework and data • Insufficient capacity for policy implementation at both national and local level • Weak national policy framework • Unresolved and mounting environmental issues – e.g. waste (e-waste, white waste, hazardous waste), air and water pollution, loss of biodiversity etc.	

	Legislative Framework	Institutional Framework	Capacity and Resources	Policy Framework	Physical/Social Issues
		• NGO sector disorganized and lack financial sustainability			
Opportunities	• National Disaster Management Framework • Access to Information Act • Local Government Reform		• Existence of best practices that could be adopted • Suitably situated for use of alternative and new technologies • Global trend towards the development of sustainable economic sectors (e.g. sustainable tourism, transportation etc.) • Existence of environmental lobby groups • Increase awareness and interest of environmental issues by the public	• Strategic Environmental Assessment Policy and process now at the implementation stage – could influence the inclusion of environmental issues into sectoral policies • Local Sustainable Development Planning Framework developed	
Threats	• Government entities sometimes		• Lack of capacity to understand the	• Overdependence on non-renewable	• Persistent poverty

	Legislative Framework	Institutional Framework	Capacity and Resources	Policy Framework	Physical/Social Issues
	do not adhere to environmental laws • Many environmental policies developed but not promulgated – resulting in continued degradation of natural resources		linkages between environmental issues and economic policy (not enough lateral thinking) • Lack of political will and vision (related to environment)	energy sources • Open access management – resulting in Tragedy of the Commons • Macroeconomic policy • High vulnerability of critical economic assets	• Globalization – creating openness to unsustainable consumption and production patterns • Climate change and the likelihood of more intense cyclonic events and coastal flooding • The country's proneness to natural and man-made disasters • Overexploitation of renewable sources

This SWOT analysis along with the Situational Analysis presented above, formed the basis for identifying goals, objectives and strategies that will be employed to addresses the weaknesses endemic to the sector, and capitalize on the opportunities towards achieving the vision identified above. The weaknesses and threats identified through the SWOT analysis are consistent with some of the key weaknesses, opportunities and threats identified.

Vision Statement

We will work together to adopt and promote measures that will help develop a sustainable society, achieve and enhance a healthy natural environment in harmony with the social and economic aspirations of Jamaica

The vision is based on a series of assumptions articulated by the task forces during their meetings. Some of these assumptions include:

- Increased environmental awareness
- Effective regulatory framework which binds government and people
- Data driven decision making with meaningful public participation, free of political interference
- Development that takes place within the carrying capacity of natural resource constraints
- Informed and committed leadership who are all champions for the environment
- Constitutional and legislative reform – right to a healthy environment, citizens right to appeal decisions made with respect to the environment
- Preservation and renewal of ecological capital

This vision provides one of the foundations on which the sector plan will be built.

We will work together to adopt and promote measures that will help develop a sustainable society, achieve and enhance a healthy natural environment in harmony with the social and economic aspirations of Jamaica

Goals, and Outcomes - "Development in Harmony with Nature"

Human wealth and prosperity is based on the use and consumption of natural resources, including materials, energy and land. Natural resources and the environment were once regarded as free goods (or factors of production) and the costs of using them were not internalized into production costs. This approach has led to a situation in which natural resources are over used and environmental services are undervalued, resulted in environmental degradation. The perception that environmental resources are free, needs to be discontinued as this approach creates high environmental costs and social inequities, in particular for those who are not using those natural resources directly. Jamaica's natural resources are an important part of the country's natural heritage and the foundation for future prosperity.

The sustainable use and management of natural resources is critical and globally has come into focus and been the subject of many policy discussions for over a decade beginning with the Earth Summit in Rio de Janeiro in 1992. The use of natural resources and the resulting impacts are strongly influenced by the prevailing type and efficiency of available technologies.

Waste Generation, Composition and Disposal

- Jamaican's are estimated to generate approximately 1 kg/per person/day of solid waste
- Total solid waste generated in Jamaica is approx. 836, 000 tonnes. An estimated 400,000 tonnes of solid waste is collected per year leaving about another 400,000 tonnes uncollected
- There are eight municipal waste disposal sites in operation across the island Jamaica but none meet all of the generally recognized criteria to qualify as a landfill site There are also no sanitary landfills.
- There is no designated hazardous waste disposal facility in Jamaica.
- Approx. 20% of Jamaica's population is served by sewerage systems operated by the NWC. The remaining 75% of Jamaica's sewage wastes are disposed of through soak away systems, septic tanks, tile fields, pit-latrines etc.

The high level of interdependence between the environment and economic and social systems in Small Island Developing States (SIDS) like Jamaica means that progress in one area cannot be attained at the expense of the other. Protecting and managing Jamaica's natural resources is very much about enhancing quality of life.[31] The origin of environmental problems that the world and certainly Jamaica is now facing lies fundamentally in the massive expansion of overall economic activities, coupled with the excessive and inefficient consumption of resources (e.g. deforestation, watershed degradation, the overfishing and pollution of marine ecosystems), and the emission of wastes beyond the environment's capacity to assimilate. Unsustainable production and consumption patterns are increasingly threatening the health of the country's ecosystems and biological diversity.

Additionally, economic losses due to resource degradation are, hard to measure and they are not yet reflected in the country's national accounts. As a consequence conservation of the natural resources is not easily viewed as critical to sustaining the economy. Long-term benefits are easily eclipsed by the need for short-term returns on investments[32].

Also, Jamaica State of the Environment Report (2005) states that there is a strong correlation between the state of the natural environment and the vulnerability of the

[31] Jamaica Social Evaluation Project, Goal 5. Status Report 2007, Cabinet Office

[32] Jamaica National Assessment Report: A Ten Year Review of the Implementation of the 1994 Barbados Programme of Action for the Sustainable Development of Small Island Developing States. 2005. Ministry of Land and Environment

country to natural hazards.[33] The Report sites poor environmental practices such as improper disposal of waste. Indiscriminate removal of forest cover, poor land use practices, squatting as exacerbating the effects of these hazards[34].

To achieve the needed improvements in the use of natural resources it is also important to strengthen the institutional and governance framework for environmental management.[35]

This section encompasses some of the initial steps identified that would enable Jamaica to have an effective and balanced approach to natural resources and environmental management and is geared towards achieving the vision. Based on the situation analysis and analysis of the SWOT, four broad areas have been identified for priority attention as follows:

- Biodiversity and Ecosystem Management
- Natural Resources Management
- Environmental Governance
- Natural Hazards Mitigation and Climate Change

[33] Jamaica National Environmental Action Plan (JANEAP) 2006 – 2009. National Environment and Planning Agency
[34] Jamaica National Environmental Action Plan (JANEAP) 2006 – 2009. National Environment and Planning Agency
[35] Country Environmental Assessment for Jamaica 2007, IADB

The sector plan is based on the vision:

"We will work together to adopt and promote measures that will help develop a sustainable society, achieve and enhance a healthy natural environment in harmony with the social and economic aspirations of Jamaica".

The four (4) main goals and associated sector outcomes of the Natural Resources & Environmental Management and Hazard Risk Reduction Sector Plan are presented below.

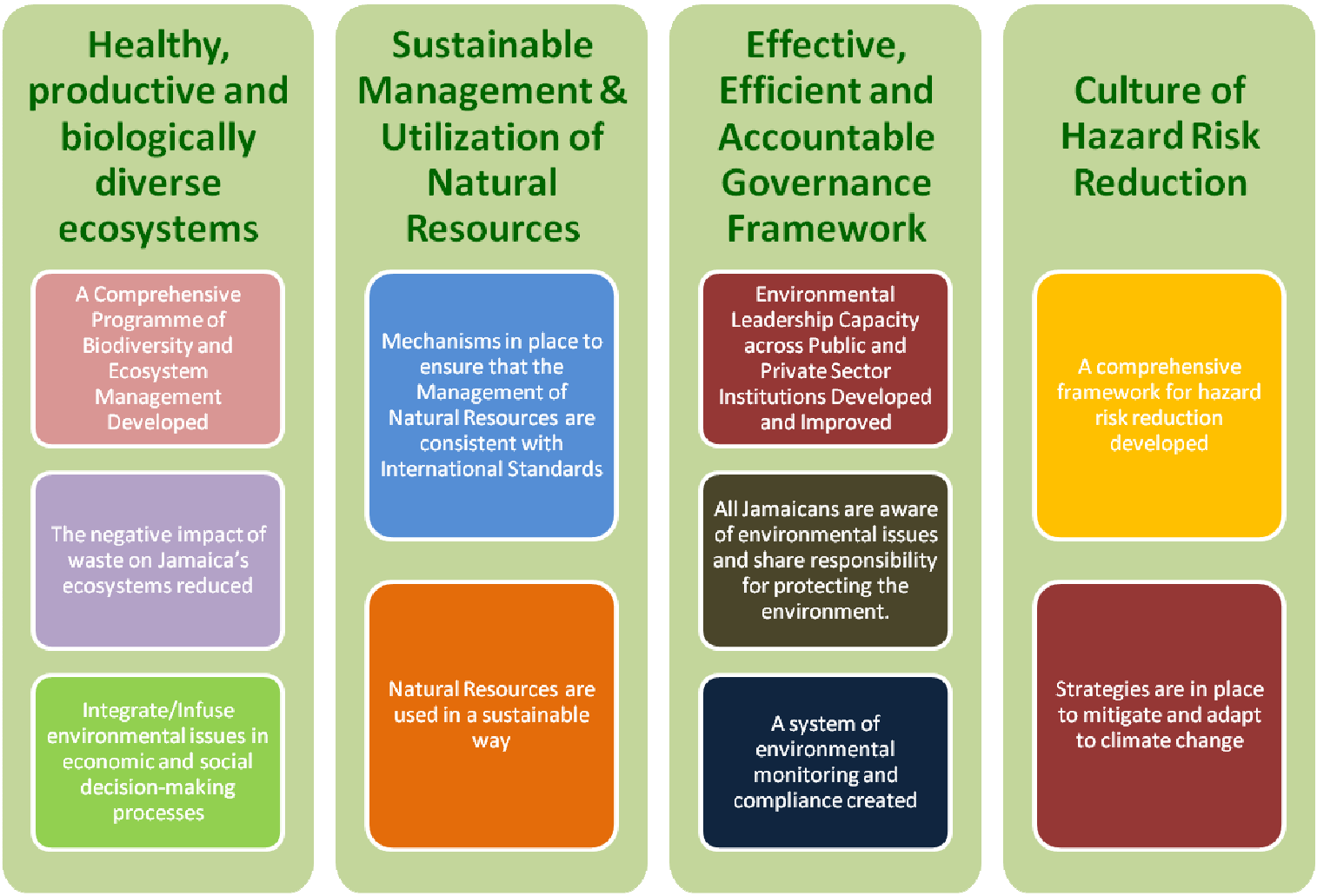


Figure 2: Sector Goals and Outcomes

Proposed Sector Indicators and Targets

The proposed indicators and targets for the Natural Resources & Environmental Management and Hazard Risk Reduction & Climate Change Sector Plan over the period 2009 -2030 are presented in Table below.

Table : Natural Resources & Environmental Management and Hazard Risk Reduction & Climate Change – Indicators and Targets

Sector Indicators	Baseline	Targets			Comments
	2007 or Most Current	2012	2015	2030	
1. Urban particulates PM_{10}					
2. Total renewable fresh water resources (Million cubic metres/year					
3. Total renewable water resources					
4. % of tested fresh water sources with results within ambient water quality					
5. Pollutants in surface water (broken down by types of pollutants					
6. % of country covered					

Sector Indicators	Baseline	Targets			Comments
	2007 or Most Current	2012	2015	2030	
with forest					
7. # of extinct species					
8. # of /endangered/vulnerable species					
9. % of the habitat within each biome that is protected and conserved					
10. Proportion of agricultural area that is arable land					
11. % of Economic Exclusive Zone are that is Protected (Marine areas)					
12. % of population using solid fuels					
13. of solid waste that is disposed at landfills					
14. Average number of days taken to restore production after a					

Sector Indicators	Baseline	Targets			Comments
	2007 or Most Current	2012	2015	2030	
national disaster 15. Average number of days taken to restore basic social services after a national disaster 16. % of population displaced by hazards 17. Average response time to disasters 18. % of damage covered by insurance 19. % of national policies that includes consideration of climate change					

Chapter 5: Implementation Framework and Action Plan

Components of Vision 2030 Jamaica - National Development Plan

The Vision 2030 Jamaica National Development Plan has three (3) components:

1. **Integrated National Development Plan:**

The integrated National Development Plan presents the overall plan for Vision 2030 Jamaica, integrating all 31 sector plans into a single comprehensive plan for long-term national development. The integrated National Development Plan presents the National Vision, the four National Goals and fifteen National Outcomes, and the National Strategies required to achieve the national goals and outcomes.

2. **Medium Term Socio-Economic Policy Framework (MTF):**

The Medium Term Socio-Economic Policy Framework (MTF), is a 3-yearly plan which summarizes the national priorities and targets for the country and identifies the key actions to achieve those targets over each 3-year period from FY2009/2010 to FY2029/2030.

3. **Thirty-one (31) Sector Plans:**

At the sectoral level Vision 2030 Jamaica will be implemented through the strategic frameworks and action plans for each sector as contained in the respective sector plans. Vision 2030 Jamaica includes a total of thirty-one (31) sector plans covering the main economic, social, environmental and governance sectors relevant to national development.

Implementation Framework

The implementation of the Natural Resources & Environmental Management and Hazard Risk Reduction & Climate Change Sector Plan is an essential component of the implementation, monitoring and evaluation framework for the Vision 2030 Jamaica – National Development Plan. The Plan is implemented at the sectoral level by ministries, departments and agencies (MDAs) of Government as well as non-state stakeholders including the private sector, NGOs and CBOs. The involvement of stakeholders is fundamental to the successful implementation of the National Development Plan and the Natural Resources & Environmental Management and Hazard Risk Reduction & Climate Change Sector Plan.

Accountability for Implementation and Coordination

The Cabinet, as the principal body with responsibility for policy and the direction of the Government, has ultimate responsibility for implementation of the National Development Plan. Each ministry and agency will be accountable for implementing the National Development Plan (NDP) through various policies, programmes and interventions that are aligned with the

strategies and actions of the NDP and the sector plans. A robust results-based monitoring and evaluation system will be established to ensure that goals and outcomes of the Plan are achieved. This system will build on existing national and sectoral monitoring and evaluation frameworks and will be highly participatory.

Resource Allocation for Implementation

Vision 2030 Jamaica places great emphasis on ensuring that resource allocation mechanisms are successfully aligned and integrated with the implementation phase of the National Development Plan and sector plans. The requirements to ensure resource allocation for implementation will include alignment of organizational plans in the public sector, private sector and civil society with the National Development Plan, MTF and sector plans; coherence between the various agency plans with the National Budget; rationalization of the prioritisation process for public sector expenditure; and increased coordination between corporate planners, project managers and financial officers across ministries and agencies.

Action Plan

The Action Plan represents the main framework for the implementation of the Natural Resources & Environmental Management and Hazard Risk Reduction & Climate Change Sector Plan for Vision 2030 Jamaica. The tracking of implementation of the Natural Resources & Environmental Management and Hazard Risk Reduction & Climate Change Sector Plan will take place through the Action Plan as well as the framework of sector indicators and targets.

The Action Plan contains the following elements:

i. Sector Goals
ii. Sector Outcomes
iii. Sector Strategies
iv. Sector Actions
v. Responsible Agencies
vi. Timeframe

LONG TERM ACTION PLAN
2009 – 2030

Goal # 1: Healthy, Productive and Biologically Diverse Ecosystems

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
A Comprehensive Programme of Biodiversity and Ecosystem Management Developed			
Adopt an ecosystems management approach	Develop innovative and cost effective integrated ecosystem management approaches to natural resources in different ecosystems	**2009-2020**	**NEPA, Environmental Management Division in the Office of the Prime Minister**
	Conduct, ecological, economic, and sociological surveys to provide information, including indigenous knowledge to guide integrated ecosystem management planning and implementation	**2009-2020**	**NEPA, Environmental Management Division in the Office of the Prime Minister**
	Conduct assessments of the linkages between key ecosystem services for human well-being at the national level	**2010 - 2018**	**NEPA, Environmental Management Division in the Office of the Prime Minister**
	Develop and implement appropriate policies, regulations, incentives and structures to support integrated ecosystem management	**2010 - 2020**	**NEPA, Environmental Management Division in the Office of the Prime Minister**
	Conduct workshops on the concept of ecosystem management and on ecosystem services, their interlinkages and the relationships to human well-being	**2010 - 2015**	**NEPA, Environmental Management Division in the Office of the Prime Minister**
Reverse loss of environmental resources through restoration initiatives	Develop mechanisms to prevent illegal exploitation and damaging of forests	**2008 - 2012**	**NEPA, Environmental Management Division in the Office of the Prime Minister, Forestry Department**

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
	Rehabilitate coral reef ecosystems	**2008 - 2020**	**NEPA, Environmental Management Division in the Office of the Prime Minister**
	Implement economic and technical programmes to encourage farmers to practice conservation farming	**2009 - 2015**	**Ministry of Agriculture, Office of the Prime Minister, Rural Agricultural Development Authority**
	Set up a fund for the rehabilitation of lands degraded during bauxite mining	**2008 - 2011**	**Ministry of Agriculture, Office of the Prime Minister, Ministry of Energy and Mining, NEPA**
	Rehabilitate degraded forest	**2008 - 2017**	**NEPA, Environmental Management Division in the Office of the Prime Minister, Forestry Department**
Promote sustainable use of biological resources	Implement programmes to raise awareness of biodiversity issues among the population	**2009 - 2013**	**NEPA, Environmental Management Division in the Office of the Prime Minister, Forestry Department, Institute of Jamaica**
	Develop public/community/private sector partnership for integrated ecosystem management, planning and implementation	**2010 - 2017**	**NEPA, Environmental Management Division in the Office of the Prime Minister, Institute of Jamaica,**
	Build capacity in relevant entities to identify and design appropriate actions to mitigate the negative impacts of direct/indirect drivers on ecosystem services	**2010 - 2017**	**NEPA, Environmental Management Division in the Office of the Prime Minister**
	Build capacity in key entities (those with responsibility for ecosystems), including CBOs and NGOs for economic valuation of ecosystem services	**2010 - 2014**	**NEPA, Environmental Management Division in the Office of the Prime Minister**

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
	Develop and implement criteria for the sustainable use of resources	**2011 - 2014**	**NEPA, Environmental Management Division in the Office of the Prime Minister**
Facilitate access to biological resources for benefit sharing	Develop appropriate mechanisms for conflict resolution among resource users and other stakeholders	**2011 - 2015**	**NEPA, Environmental Management Division in the Office of the Prime Minister**
	Build capacity in institutions to ensure a rights, entitlements and ownership approach to encourage the equitable access and use of ecosystem services for human well-being	**2011 - 2014**	**NEPA, IOJ, Office of the Prime Minister**
	Create networks for data and information sharing on ecosystem services for human well-being	**2011 - 2014**	**IOJ, NEPA, Office of the Prime Minister**
	Protect traditional knowledge and create a traditional knowledge register/library	**2010**	**NBC, IOJ, NEPA, Environmental Management Division in the Office of the Prime Minister**
	Prepare policies and legislation to facilitate access to biological resources and equitable benefits sharing	**2011 - 2017**	**NEPA, IOJ, Office of the Prime Minister**
	Enact of new Fisheries Bill	**2009-2017**	Fisheries Division
	Finalization of a national beach policy	**2009-2010**	**Management Division in the Office of the Prime Minister, NEPA**
	Prepare material transfer agreements for the use and removal from the wild of Jamaica's flora and fauna	**2011 - 2017**	**NEPA, Management Division in the Office of the Prime Minister,**
	Develop and implement a pilot project on the use of casitas and condomimiums as a means of enhancing lobster populations	**2009 - 2010**	Fisheries Division, Ministry of Agriculture
Ensure safe transfer, handling and use of living modified organisms	Promulgate national bio safety policy	**2010-2012**	**NCST, NEPA, Environmental Management Division in**

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
			the Office of the Prime Minister
	Establish a National Biosafety Framework	**2008 - 2011**	**NCST, NEPA, Environmental Management Division in the Office of the Prime Minister**
	Raise awareness in biotechnology and biosafety and strengthen the capacity of the main stakeholders	**2010 - 2015**	**NCST, NEPA, Environmental Management Division in the Office of the Prime Minister**
Support the implementation of forestry management initiatives	Develop and implement the forest conservation and management plan	**2009-2013**	**Forestry Department Ministry of Agriculture**
	Maintain and restore forest cover	**2009-2013**	**Forestry Department Ministry of Agriculture**
	Increase the participation of the private sector and non-governmental organizations in forestry management initiatives	**2009-2013**	**Forestry Department Ministry of Agriculture Private Sector**
	Build the capacity of NGOs and private land owners to manage forestry and conservation projects	**2009-2013**	**Forestry Department Ministry of Agriculture**
	Establish local watershed/forestry management communities	**2008-Ongoing**	NEPA/ Forestry Department
	Implementation of effective patrolling and policing of transported timber and enforcement laws	**2008 – Ongoing**	Forestry Department NEPA Island Special Constabulary Force
Support implementation of the terrestrial and marine protected areas	Declare additional forest reserves	**2008 – Ongoing**	Forestry Department
Promote and coordinate research to enhance scientific understanding of ecosystems, including their economic contributions to national development	Continue, encourage and expand research and ground monitoring to provide an improved understanding of the rate and extent of degradation within remaining natural broadleaf forests, and to develop improved approaches for measuring and reversing degradation.	**2008-2012**	**Forestry Department Ministry of Agriculture**
The negative impact of waste on Jamaica's ecosystems reduced			
Create an integrated framework for the	Establish a system for the safe management of medical waste	**2008-2013**	**Ministry of Health and the Environment,**

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
management of all types of waste			**Environmental Management Division in the Office of the Prime Minister, NSWMA, NEPA**
	Develop a waste information system	**2009-2011**	**Ministry of Health and the Environment, Environmental Management Division in the Office of the Prime Minister, NSWMA, PIOJ, NEPA**
	Construct infrastructure for hazardous waste, including collection points and storage facilities	**2010-2013**	**NSWMA, Ministry of Health and the Environment,**
	Improve and expand the country's waste management infrastructure	**2013-2016**	**NSWMA, Ministry of Health and the Environment,**
	Develop and implement pilot projects on waste collection (e.g. oil, composting separation of special types of waste – e.g. paper, cardboard, plastics etc.	**2009-2017**	**NSWMA, Ministry of Health and the Environment, Environmental Management Division in the Office of the Prime Minister, NEPA**
	Optimize the collection system for municipal waste	**2008-2010**	**NSWMA, Office of the Prime Minister**
	Develop a strategic plan for waste management	**2009-2011**	**NSWMA,**
	Introduce economic instruments for the management of wastes	**2014-2018**	**NSWMA, Ministry of Health and the Environment, Environmental Management Division in the Office of the Prime Minister, NEPA, PIOJ, Ministry of Finance and the Public Service**
	Develop a financially and environmentally sustainable system for environment and waste management that responds to present and future needs	**2009-2013**	**NSWMA, Ministry of Health and the Environment, Environmental Management Division in the Office of the Prime Minister, NEPA, PIOJ, Ministry of Finance and the Public Service**
Support dynamic and on-going initiatives on the	Establish a fee structure based on the quantity and quality of	**2010 - 2012**	**NEPA, Environmental Management Division in**

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
implications of waste on ecosystems	discharge of industrial effluents		**the Office of the Prime Minister, Ministry of Finance and the Public Service**
	Develop a programme for monitoring municipal sewage and industrial waste water treatment plants	**2008 – Ongoing**	**NEPA, NWC, National Solid Waste Management Authority**
	Develop and implement cost recovery mechanisms by promoting recycling and reuse initiatives for proper disposal of solid waste	**2011**	**NSWMA, PIOJ, NEPA, Environmental Management Division in the Office of the Prime Minister, Ministry of Finance and the Public Service**
	Engage in sewage rehabilitation, operation and maintenance programme to enable existing sewage treatment systems to function at a level to which they were originally designed	**2008 - 2014**	**National Water Commission, NEPA**
	Establish a new sewerage system for the KMA	**2007 - 2012**	**National Water Commission**
Integrate the informal sector in the management of wastes	Develop local area plans for the management of wastes	**2010 - 2013**	**NSWMA, NEPA,**
	Implement a code of practice for the recovery of recyclables and the provision of legal support in the development of recycling programmes	**2008 - 2011**	**NSWMA , NEPA, Office of the Prime Minister**
	Formalize the solid waste sector through the development of licencing regulations, standards and procedures for applicants	**2009 - 2015**	**NSWMA, Office of the Prime Minister, NEPA**
	Implement cost recovery methods through the promotion of recycling and reuse initiatives for proper disposal of wastes	**2009 - 2013**	**NSWMA , Ministry of Finance and the Public Service, NEPA**

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
	Implement a sanitation and neighborhood clean-up/maintenance programme to improve solid waste management, sanitation and beautification within Downtown Kingston	**2008-2010**	**Kingston Restoration Company, NSWMA, NEPA**
Create incentives for the development of markets for waste	Implement pilot projects on the energy potential of waste	**2008-2020**	**PCJ, NSWMA, NEPA, PIOJ, Ministry of Energy and Mining**
Integrate/Infuse environmental issues in economic and social decision-making processes			
Create mechanisms at the national level and in decision making process to ensure the use of impact assessments (biodiversity impact assessments/SEA/HIA etc. in sectoral policy development	Implement the GOJ SEA Policy	**2009 onwards for all new national policies**	**Cabinet Office,**
	Promulgate the Environmental Stewardship Policy	**2009**	**Office of the Prime Minister**
Create processes that will enable the integrated management and sustainable development of Jamaica's natural resources	Adopt natural resource valuation as a key tool of the management of natural resources	**2008-2020**	**NEPA, Office of the Prime Minister,**
Develop mechanisms that effectively integrate environmental management with urban planning and regional development	Provide institutional mechanisms to upgrade environmental conditions in low income urban settlements	**2011 – 2015**	**NEPA, UDC, Office of the Prime Minister, National Land Agency, National Solid Waste Management Authority**

Goal # 2 - Sustainable Management & Utilization of Natural Resources

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
Mechanisms in place to ensure that the management of natural resources are consistent with international standards			
Create frameworks that will enable the integrated management and sustainable development of Jamaica's natural resources	Conduct an initial mapping and specification of major environmental challenges relevant to the sector	**2010 - 2012**	**NEPA, Office of the Prime Minister, Forestry Department, Water Resources Authority**
	Conduct an audit of the country's environmental resources	**2012 - 2014**	**NEPA, Forestry Department, Fisheries Division, WRA, Office of the Prime Minister**
	Establish a national land use plan	**2009 - 2012**	**OPM, NLA**
	Finalize and promulgate the protected areas system master plan	**2009 – 2012**	
	Conduct soil inventory and mapping	**2012 - 2014**	**Ministry of Agriculture, RADA**
	Control the use of hazardous and dangerous chemicals to avoid soil contamination	**2013**	**Ministry of Agriculture Forestry Department**
	Establish and introduce instruments for the reduction of water pollution	**2008 Ongoing**	**NEPA, Ministry of Finance and the Public Service, Office of the Prime Minister**
Implement best management practices for air, forest, ground and surface water, land management, soils and resources consumption	Prepare a complete inventory of forest ecosystems	**2009 - 2011**	**Forestry Department**
	Develop an integrated water management policy based on sustainable development principles	**2009 - 2012**	**Water Resources Authority, NEPA, NWC, Ministry of Water and Housing**
	Develop a national air monitoring system	**2010 - 2012**	**NEPA, Ministry of Health and Environment**
	Introduce procedures for sustainable land management	**2010 - 2015**	**NEPA, Office of the Prime Minister, National Land Agency**
	Develop policies for soil protection	**2012 – Ongoing**	**NEPA, Office of the Prime Minister, National Land Agency**
	Include an air protection component in the energy sector and other sectoral strategies, such as transport, industry and agriculture	**2009 - 2018**	**NEPA, Ministry of Energy and Mining, Ministry of Transport and Works, Office of the Prime Minister**

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
	Prepare, adopt and implement regulations and procedures for emissions from stationary and mobile sources	**2012 – Ongoing**	**NEPA, Ministry of Health and Environment**
Create a framework that will ensure the sustainable management of natural resources	Implement a national policy and legislation on municipal integrated development planning, and co-ordinating Land Use Management Systems	**2014 - 2017**	**NEPA, Office of the Prime Minister, National Land Agency,**
Establish linkages between environmental and urban planning, regional development and sectoral strategies	Develop and improve interventions and approaches that build and enhance inter-government co-operation	**2010 - 2014**	**Office of the Prime Minister, NEPA, UDC, Local Government Department**
Encourage greater application of land use planning techniques for environmental management	Introduce update land use policy and prepare guidelines for land use practices in other development policies and guidelines	**2010 - 2015**	**National Land Agency, Cabinet Office, Office of the Prime Minister, NEPA**
Preserve scenic, cultural and historic resources	Build capacity of institutions involved in nature and biodiversity natural and cultural heritage conservation	**2012 - 2015**	**Office of the Prime Minister, NEPA, UDC, Jamaica National Heritage Trust**
	Establish legal and institutional system for protecting biodiversity, natural and cultural heritage (and implement components already established)	**2007 – 2020**	**NEPA, Jamaica Conservation and Development Trust, other select NGOs,**
	Integrate biodiversity, natural and cultural heritage concerns in all relevant sectors	**2013 – 2020**	**NEPA, Jamaica National Heritage Trust**
Promote the use of new and clean technologies	Prepare guidelines for using ecological materials during construction works	**2011 – 2013**	**NEPA, Jamaica Institution of Engineers, Construction Industry**
	Provide institutional support to initiatives for use of clean technologies and renewable resources	**2012 - 2015**	**NEPA, Office of the Prime Minister, Ministry of Energy and Mining, Petroleum Corporation of Jamaica**
	Develop regulations for the energy performance of buildings	**2008 – 2014**	**NEPA, Office of the Prime Minister, Ministry of Energy and Mining, Petroleum Corporation of Jamaica, Jamaica**

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
			Bureau of Standards
	Introduce cleaner technologies to replace old equipment and old industry technology	**2015 - 2022**	**NEPA, Ministry of Finance and the Public Service, Office of the Prime Minister**
Ensure that Government meets obligations under International Environmental Agreements			
Natural Resources are used in a sustainable way			
Engage communities in sustainable natural resources development	Develop a sustainable community development action plan to guide community engagement in natural resources management	**2011 - 2012**	**NEPA, NGOs, Forestry Department, Ministry of Agriculture**
	Develop programmes to sensitize and mobilize communities on managing natural resources	**2012 - 2015**	**NEPA, NGOs, Forestry Department**
Strengthen the capacity of local organizations to facilitate citizen participation in decision-making affecting natural resources	Collaborate with industry through a defined framework for the involvement of industry as a partner for solving environmental problems	**2010 – Ongoing**	**NEPA, Office of the Prime Minister, Ministry of Industry, Investment and Commerce, Jamaica Trade and Invest**
	Prepare and implement management plans for all protected areas through an approach involving community participation	**2008 - 2014**	**NEPA, Office of the Prime Minister**
Build sustainability principles into sectoral policy and programme development to protect the environment and to satisfy the needs of the population and the economy	Monitor the impact of the transport sector on the natural environment	**2010 – Ongoing**	**NEPA, Ministry of Transport and Works, Climate Change Unit, Met Office**
	Implement pilot projects for the increase in eco-efficiency in industry	**2014 – 2025**	**NEPA, Ministry of Industry, Investment and Commerce, Ministry of Finance and the Public Service**
	Rehabilitate and construct infrastructure (water supply, sewage networks and wastewater treatment facilities)	**2008 – 2015**	**Ministry of Water and Housing,**
	Develop a plan for the stimulation of scientific	**2011 – 2018**	**NEPA, Office of the Prime Minister,**

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
	environmental research in industry and mining		**Scientific Research Council, JIEP,**
Create mechanisms at the national level and in decision making process to ensure environmental issues are infused in developmental objectives and investment processes	Implement the GOJ SEA Policy	**2009 – Ongoing**	**Cabinet Office, Office of the Prime Minister, all ministries of GOJ, NEPA**
	Apply foresighting techniques to plan for emerging environmental issues	**2012 – Ongoing**	**NEPA, UWI, Office of the Prime Minster**

Goal # 3 - Effective, Efficient, and Accountable Governance Framework for Environment and Natural Resources

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
Environmental leadership capacity across public and private sector institutions developed and improved			
Mainstream environmental concerns in the decision-making process to ensure the use of impact assessments for development projects – BIA/SEA/HIA	Implement GOJ SEA Policy	**2009 – Ongoing**	**Cabinet Office, Office of the Prime Minister, all ministries of GOJ, NEPA**
	Develop framework for the introduction of health impact assessments, and biodiversity impact assessments in policy development	**2014 - 2018**	**Cabinet Office, Office of the Prime Minister, all ministries of GOJ, NEPA**
Build openness and accountability into organizational practices and principles			
Encourage transformative leadership in environmental institutions	Create customer oriented focus in environmental institutions – participate in the Government's		
	Build capacity – systems, processes, infrastructure, and personnel of environmental institutions	**2009 - 2017**	**Office of the Prime Minister, Cabinet Office (PSMD), NEPA, Forestry Department, Fisheries Division**
Create frameworks to ensure that environmental information is accurate and accessible to all stakeholders	Implement a Plan for Public Education to achieve behaviour change	**2010 - 2015**	**NEPA, Office of the Prime Minister, NGOs**
Establish mechanisms to foster coordination and collaboration among resource management agencies on resource protection issues.			
All Jamaicans are aware of environmental issues and share responsibility for			

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
protecting the environment			
Infuse environmental education in the curricula at all levels of the Jamaican education system			
Promote environmental awareness by the public to enable effective participation environmental initiatives	Implement a Plan for Public Education to achieve behaviour change	**2010 - 2015**	**NEPA, Office of the Prime Minister, NGOs**
Create incentives for community involvement in environmental enhancement initiatives			
A system of environmental monitoring and compliance created			
Ensure environmental compliance by all sectors in the country through the creation of the necessary mechanisms	Develop a comprehensive risk based national action plan for environmental monitoring	**2011 – 2013**	**NEPA, ISCF, Forestry Department, Fisheries Division**
	Provide information to local industry and encourage them to adopt Environmental Management Systems	**2009 – 2015**	**NEPA, Office of the Prime Minister, Ministry of Industry, Investment and Commerce, JMA, JTI, BSJ**
	Develop a series of standard operating procedures for specific classes of activity, for example hazardous materials & fuel storage systems	**2011 – 2016**	**NEPA, Office of the Prime Minister**
	Prepare guidelines to ensure that all government ministries and agencies comply with all applicable environmental Acts and Regulations	**2009 - 2011**	**NEPA, ISCF, Forestry Department, Fisheries Division**
Create dynamic and responsive regulatory environment	Update and strengthen relevant legislation	**2009 - 2025**	**NEPA, Office of the Prime Minister, Ministry of Health and Environment, Forestry Department, Office of the Chief Parliamentary**

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
			Council, Cabinet Office

Goal # 4: Culture of Hazard Risk Reduction

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
A comprehensive framework for hazard risk reduction developed			
Develop mechanisms that integrate disaster risk reduction in development planning	Conduct baseline assessment on the state of the disaster risk reduction	**2008- 2010**	**ODPEM, Cabinet Office, Office of the Prime Minister**
	Develop and adopt policies and legislation for disaster risk reduction	**2008- 2010**	**ODPEM, Cabinet Office, Office of the Prime Minister**
	Establish baseline information for disaster risk reduction, including disaster profile, national policies, strategies, capacities, resources and programmes	**2009 - 2018**	**ODPEM, Office of the Prime Minister, NEPA, National Disaster Management Committee, Jamaica Red Cross**
	Identify capacities and gaps in the legal, institutional and policy frameworks for disaster risk reduction	**2008 - 2010**	**ODPEM, Cabinet Office, Office of the Prime Minister**
	Review disaster risk reduction policy options and determine priorities for action	**2008 – Ongoing**	**ODPEM, Cabinet Office, Office of the Prime Minister**
	Develop a plan comprising the recommended changes to policies and practices and describing the proposed disaster risk reduction programmes	**2010 - 2012**	**ODPEM, Cabinet Office, Office of the Prime Minister, NEPA, National Disaster Management Committee, Jamaica Red Cross**
	Allocate appropriate resources for risk reduction activities	**2009 – Ongoing**	**ODPEM, Cabinet Office, Office of the Prime Minister, NEPA, National Disaster Management Committee, Jamaica Red Cross**
	Formalise the assignment of responsibilities for disaster risk reduction activities to	**2009 – Ongoing**	**ODPEM, Cabinet Office, Office of the Prime Minister, NEPA,**

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
	organisations through law, implementing regulation etc.		**National Disaster Management Committee**
	Develop capability to respond to mass casualties	**2010 – 2014**	**ODPEM, Cabinet Office, Office of the Prime Minister, NEPA, National Disaster Management Committee, Ministry of Health and Environment, National Red Cross**
	Develop result-oriented work plans of national platforms for coordinating the implementation of disaster risk reduction in line with the Hyogo Framework for Action	**2009 – Ongoing**	**ODPEM, Cabinet Office, Office of the Prime Minister, NEPA, National Disaster Management Committee**
Build awareness of natural hazards among all stakeholders	Identify disaster risk reduction champions who can lead the charge for making disaster risk reduction a national priority	**2009 – Ongoing**	**Office of the Prime Minister, ODPEM, National Disaster Management Committee**
	Develop communication and dissemination mechanisms for disaster risk information and early warning	**2009 - 2013**	**Office of the Prime Minister, ODPEM, National Disaster Management Committee**
	Integrate disaster risk reduction in the education system and research community	**2012 – 2014**	**Office of the Prime Minister, ODPEM, National Disaster Management Committee, Ministry of Education, UWI, UTECH**
	Develop disaster risk reduction training for different groups of stakeholders	**2012 – 2014**	**Office of the Prime Minister, ODPEM, National Disaster Management Committee, Ministry of Education, UWI, UTECH, Social Development Commission, Association of Development Agencies (ADA)**

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
	Develop a programme to raise awareness of disaster risk reduction and empower all levels of society	**2010 – Ongoing**	**Office of the Prime Minister, ODPEM, National Disaster Management Committee**
Implement best practices for hazard risk management	Implement early warning systems	**2008 - 2014**	**Office of the Prime Minister, ODPEM, National Disaster Management Committee**
	Benchmark progress made in promoting disaster risk reduction and its mainstreaming into development planning and practices	**2017 - 2030**	**Office of the Prime Minister, ODPEM, National Disaster Management Committee**
	Document lessons learned and good practices and sharing the findings	**2009 – Ongoing**	**Office of the Prime Minister, ODPEM, National Disaster Management Committee, Ministry of Information and Telecommunications**
Support community-based approach to hazard risk reduction	Engage in and set up multi-stakeholder dialogues to establish the foundation for disaster risk reduction	**2009 – ongoing**	**Office of the Prime Minister, ODPEM, National Disaster Management Committee, Ministry of Information and Telecommunications**
All Jamaicans are aware of environmental issues and share responsibility for protecting the environment			
Create mechanisms to enable all government policies and plans fully consider the implementation of climate change	Undertake hazard risk management for coastal communities	**2009 – 2012**	**ODPEM, NEPA**
	Undertake comprehensive mapping of the flood plains throughout the island	**2009 – 2012**	**WRA, ODPEM, NEPA**
	Strengthen democracy and governance in communities related to disaster response	**2009 - 2012**	**ODPEM, SDC, NEPA**
	Establish a national climate change committee	**2009 – 2012**	**Met. Office, OPM**
Identify strategic priorities for climate change	Implement National Energy Policy	**2009-2030**	**Ministry of Energy, Petroleum Corporation of Jamaica, Office of the Prime Minister, Office of Utilities Regulation**
	Prepare 2nd National	**2008 – 2010**	**Met. Office, OPM**

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
	Communications to the UNFCCC		
Adopt best practices for climate change adaptation	Develop sector specific action plans to assist with the mitigation and adaptation of climate change for all sectors	**2009 – 2020**	**Met. Service, NEPA, Office of the Prime Minister, MOHE,**
	Develop a climate change communications strategy	**2009 – 2012**	**Met. Office, ODPEM, NEPA, NEEC, OPM**
	Implement the climate change communications strategy	**2011 – 2030**	**Met. Office, ODPEM, NEPA, NEEC, OPM**
	Develop public awareness programmes on climate change	**2009 – 2012**	**Met. Office, ODPEM, NEPA, NEEC, OPM**
	Provide loans, best practices to private sector companies/manufacturing sector to invest in cleaner technologies	**2012 - 2016**	**Ministry of Industry, Investment and Commerce, Ministry of Energy, Office of the Prime Minister, NEPA,**
	Promote understanding of climate change issues through local and community media	**2010 – 2025**	**Met. Office, NEPA, Office of the Prime Minister, ODPEM**

Appendices

Appendix 1: List of Task Force Members of the Combined Task Forces[36]

- Chair - Natural Resources and Environmental Management – Eleanor Jones
- Chair - Hazard Risk Reduction and Climate Change – Franklin McDonald
- Technical Secretary – Hopeton Peterson
- Sustainable Development Specialist – Elizabeth Emanuel

Ronald Jackson Acting Executive Director Office of Disaster Preparedness and Emergency Management	Marilyn Headley Conservator of Forests Forestry Department	Dr. David Smith Programme Manager United Nations Development Programme
Bethune Morgan Planning and Research Manager National Solid Waste Management Authority	Norman Harris Director Mines and Geology Division	Diana McCaulay Executive Director Jamaica Environment Trust
Doreen Prendergast President, Jamaica Institution of Planners	Tracy Commock Director, Natural History Division Institute of Jamaica	Leonie Barnaby Director Ministry of Local Government and Environment
Commander Sydney Innis HMJS Cagway Coast Guard	Errol Cameron Fishermens Cooperative	Dr. Elaine Fisher
Gina Sanguinetti Phillips Chairman National Environmental Education Committee	Novlette Douglas Programme Manager GOJ/CIDA Environmental Action (ENACT) Programme	Peter Espeut Executive Director Caribbean Coastal Area Management Foundation
Professor Elizabeth Thomas-Hope Departments of Geology and Geography University of the West Indies	Ana Treasure Environmental Health Advisor Pan American Health Organization	Dr. Dale Webber Head, Life Sciences Centre for Marine Science University of the West Indies
Ianthe Smith Managing Director	Laleta Davis-Mattis Executive Director	Tina Williams Director – Tourism

[36] Columns highlighted represent persons who also members of the combined working group.

Engineering and Environmental Managers Limited	Jamaica National Heritage Trust	Facilitation Ministry of Tourism
Andre Kong Director of Fisheries Fisheries Division	Errol Mortley National Works Agency	Anthony McKenzie Manager – Strategic Planning National Environment and Planning Agency
Michael Archer President Jamaica Master Builders Association	Samuel McIntosh Jamaica Fire Brigade	Charles Scarlette Deputy Commissioner of Police Jamaica Constabulary Force
Philbert Brown Director Ministry of Local Government and the Environment	Dr. Leary Myers Chief Executive Officer National Environment and Planning Agency	Dr. Balfour Spence Department of Geology and Geography University of the West Indies
Dr. Michael Taylor Department of Physics – Climate Studies Group University of the West Indies	Carmen Griffiths Construction and Resource Development Company	Andrew Levy President Insurance Association of Jamaica
Karleen Black Earthquake Unit University of the West Indies	Dr. Parris Lyew-Aye Infamatics Unit University of the West Indies	Dr. Rafi Ahmad Department of Geology and Geography University of the West Indies
Basil Fernandez Managing Director Water Resource Authority	Dr. David Smith Managing Director Smith Warner International Limited	Professor Edward Robinson Head Marine Geology Unit Department of Geology and Geography University of the West Indies
Clifford MahLung Meteorological Services Ministry of Local Government and the Environment	Andreas Haiduk Water Resources Authority	