

Country Document on Disaster Risk Reduction **JAMAICA, 2014**



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TERMS AND DEFINITIONS¹

Acceptable Risk

The level of potential losses that a society or community considers acceptable given existing social, economic, political, cultural, technical and environmental conditions.

Adaptation

The adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Biological Hazard

Process or phenomenon of organic origin or conveyed by biological vectors, including exposure to pathogenic micro-organisms, toxins and bioactive substances that may cause loss of life, injury, illness or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Building Code

A set of ordinances or regulations and associated standards intended to control aspects of the design, construction, materials, alteration and occupancy of structures that are necessary to ensure human safety and welfare, including resistance to collapse and damage.

Capacity

The combination of all the strengths, attributes and resources available within a community, society or organisation that can be used to achieve agreed goals.

Capacity Development

The process by which people, organisations and society systematically stimulate and develop their capacities over time to achieve social and economic goals, including through improvement of knowledge, skills, systems, and institutions.

Climate Change

(a) The Inter-governmental Panel on Climate Change (IPCC) defines climate change as: “a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcing, or to persistent anthropogenic changes in the composition of the atmosphere or in land use”.

(b) The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods”.

¹ Definitions used were taken from the UNISDR Terminology on Disaster Risk Reduction. 2009 unless otherwise stated. Information obtained from:

http://www.unisdr.org/files/7817_UNISDRTerminologyEnglish.pdf

TERMS AND DEFINITIONS cont'd

Contingency Planning

A management process that analyses specific potential events or emerging situations that might threaten society or the environment and establishes arrangements in advance to enable timely, effective and appropriate responses to such events and situations.

Coping Capacity

The ability of people, organisations and systems, using available skills and resources, to face and manage adverse conditions, emergencies or disasters.

Corrective Disaster Risk Management

Management activities that address and seek to correct or reduce disaster risks which are already present.

Critical Facilities

The primary physical structures, technical facilities and systems which are socially, economically or operationally essential to the functioning of a society or community, both in routine circumstances and in the extreme circumstances of an emergency.

Disaster

A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.

Disaster Risk

The potential disaster losses, in lives, health status, livelihoods, assets and services, which could occur to a particular community or a society over some specified future time period.

Disaster Risk Management

The systematic process of using administrative directives, organisations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster.

Disaster Risk Reduction

The concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.

Disaster Risk Reduction Plan

A document prepared by an authority, sector, organisation or enterprise that sets out goals and specific objectives for reducing disaster risks together with related actions to accomplish these objectives.

TERMS AND DEFINITIONS cont'd

Early Warning System

The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organisations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss.

Ecosystem Services

The benefits that people and communities obtain from ecosystems.

El Niño-Southern Oscillation Phenomenon

A complex interaction of the tropical Pacific Ocean and the global atmosphere that results in irregularly occurring episodes of changed ocean and weather patterns in many parts of the world, often with significant impacts over many months, such as altered marine habitats, rainfall changes, floods, droughts, and changes in storm patterns.

Emergency Management

The organisation and management of resources and responsibilities for addressing all aspects of emergencies, in particular preparedness, response and initial recovery steps.

Emergency Services

The set of specialized agencies that have specific responsibilities and objectives in serving and protecting people and property in emergency situations.

Environmental Degradation

The reduction of the capacity of the environment to meet social and ecological objectives and needs.

Environmental Impact Assessment

Process by which the environmental consequences of a proposed project or programme are evaluated, undertaken as an integral part of planning and decision making processes with a view to limiting or reducing the adverse impacts of the project or programme.

Epidemic²

The occurrence in a community or region of cases of an illness, specified health behavior, or other health-related events clearly in excess of normal expectancy; the community or region, and the time period in which cases occur, are specified precisely.

Exposure

People, property, systems, or other elements present in hazard zones that are thereby subject to potential losses.

Extensive Risk

The widespread risk associated with the exposure of dispersed populations to repeated or persistent hazard conditions of low or moderate intensity, often of a highly localised nature, which can lead to debilitating cumulative disaster impacts.

² A Dictionary of Epidemiology

TERMS AND DEFINITIONS cont'd

Forecast

Definite statement or statistical estimate of the likely occurrence of a future event or conditions for a specific area.

Geological Hazard

Geological process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Greenhouse Gases

Gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation of thermal infrared radiation emitted by the Earth's surface, the atmosphere itself, and by clouds.

Hazard

A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Hydro-meteorological Hazard

Process or phenomenon of atmospheric, hydrological or oceanographic nature that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Intensive Risk

The risk associated with the exposure of large concentrations of people and economic activities to intense hazard events, which can lead to potentially catastrophic disaster impacts involving high mortality and asset loss.

Land-use Planning

The process undertaken by public authorities to identify, evaluate and decide on different options for the use of land, including consideration of long term economic, social and environmental objectives and the implications for different communities and interest groups, and the subsequent formulation and promulgation of plans that describe the permitted or acceptable uses.

Mitigation

The lessening or limitation of the adverse - impacts of hazards and related disasters.

National Platform for Disaster Risk Reduction

A generic term for national mechanisms for coordination and policy guidance on disaster risk reduction that are multi-sectoral and inter-disciplinary in nature, with public, private and civil society participation involving all concerned entities within a country.

Natural Hazard

Natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

TERMS AND DEFINITIONS cont'd

Non-communicable Chronic Diseases³

Non-communicable diseases (NCDs), also known as chronic diseases, are not passed from person to person. They are of long duration and generally slow progression. The four main types of non-communicable diseases are cardiovascular diseases (like heart attacks and stroke), cancers, chronic respiratory diseases (such as chronic obstructed pulmonary disease and asthma) and diabetes.

Outbreak⁴

A disease outbreak is the occurrence of cases of disease in excess of what would normally be expected in a defined community, geographical area or season. An outbreak may occur in a restricted geographical area, or may extend over several countries. It may last for a few days or weeks, or for several years.

A single case of a communicable disease long absent from a population, or caused by an agent (e.g. bacterium or virus) not previously recognized in that community or area, or the emergence of a previously unknown disease, may also constitute an outbreak and should be reported and investigated.

Pandemic⁵

A pandemic is the worldwide spread of a new disease. An influenza pandemic occurs when a new influenza virus emerges and spreads around the world, and most people do not have immunity. Viruses that have caused past pandemics typically originated from animal influenza viruses.

Preparedness

The knowledge and capacities developed by governments, professional response and recovery organisations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions.

Prevention

The outright avoidance of adverse impacts of hazards and related disasters

Prospective Disaster Risk Management

Management activities that address and seek to avoid the development of new or increased disaster risks.

Public Awareness

The extent of common knowledge about disaster risks, the factors that lead to disasters and the actions that can be taken individually and collectively to reduce exposure and vulnerability to hazards.

³ http://www.who.int/topics/noncommunicable_diseases/en/

⁴ http://www.who.int/topics/disease_outbreaks/en/

⁵ http://www.who.int/csr/disease/swineflu/frequently_asked_questions/pandemic/en/

TERMS AND DEFINITIONS cont'd

Recovery

The restoration, and improvement where appropriate, of facilities, livelihoods and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors.

Residual Risk

The risk that remains in unmanaged form, even when effective disaster risk reduction measures are in place, and for which emergency response and recovery capacities must be maintained.

Resilience

The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.

Response

The provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected.

Retrofitting

Reinforcement or upgrading of existing structures to become more resistant and resilient to the damaging effects of hazards.

Risk

The combination of the probability of an event and its negative consequences.

Risk Assessment

A methodology to determine the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend.

Risk Management

The systematic approach and practice of managing uncertainty to minimize potential harm and loss.

Risk Transfer

The process of formally or informally shifting the financial consequences of particular risks from one party to another whereby a household, community, enterprise or state authority will obtain resources from the other party after a disaster occurs, in exchange for ongoing or compensatory social or financial benefits provided to that other party.

Socio-natural Hazard

The phenomenon of increased occurrence of certain geophysical and hydro-meteorological hazard events, such as landslides, flooding, land subsidence and drought, that arise from the interaction of natural hazards with overexploited or degraded land and environmental resources.

TERMS AND DEFINITIONS cont'd

Structural and Non-structural Measures

(A) Structural measures: Any physical construction to reduce or avoid possible impacts of hazards, or application of engineering techniques to achieve hazard resistance and resilience in structures or systems;

(B) Non-structural measures: Any measure not involving physical construction that uses knowledge, practice or agreement to reduce risks and impacts, in particular through policies and laws, public awareness raising, training and education.

Sustainable Development

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Technological Hazard

A hazard originating from technological or industrial conditions, including accidents, dangerous procedures, infrastructure failures or specific human activities, that may cause loss of life, injury, illness or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Vulnerability

The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard.

INTRODUCTION

The ultimate responsibility for Disaster Risk Management (DRM) in Jamaica lies with the Hon. Prime Minister who chairs the multi-stakeholder National Disaster Committee. Reporting to the Prime Minister is the Minister with responsibility for DRM. The Office of Disaster Preparedness and Emergency Management (ODPEM) a statutory body established under the Disaster Preparedness and Emergency Management legislation is the agency designated to manage the country's DRM programme. ODPEM led the process of development and updating of the Jamaica Country Document on Disaster Risk Reduction (DRR) hereafter referred to as the 'Country Document'.

The purpose of the Country Document is to provide a comprehensive overview of the status of DRR in Jamaica.

It is expected that the Country Document will be useful to national and local authorities, agencies, stakeholders and actors linked to DRR as a national reference document.

It has been recommended that the review and update of The Country Document coincide with national mid-term reviews. However, an update of the document should be considered after any disasters which affect the country.

Objective and Scope

The report provides a snapshot of current efforts in DRR, and over time will track progress made in reducing disaster risks. The Country Document also records definition of priorities and strategies, major challenges tackled in reducing not only loss of lives, but also the economic, social and environmental impacts associated with disaster risks. It should be periodically updated as new information becomes available. The update frequency of the Country Document will depend on Jamaica's needs, new and emerging hazards and the availability of data. However, it is expected that updating will be done before information becomes outdated. The main objective is that the Country Document becomes a record of DRR efforts of the country.

Method

This Country Document was updated in December 2014 by the Disaster Risk Reduction Centre, University of the West Indies on behalf of the United Nations Office for Disaster Reduction (UNISDR) through HelpAge International (HAI) in partnership with the Office of Disaster Preparedness and Emergency Management (ODPEM).

The process of updating the country document is highlighted in Figure 1.1 below:

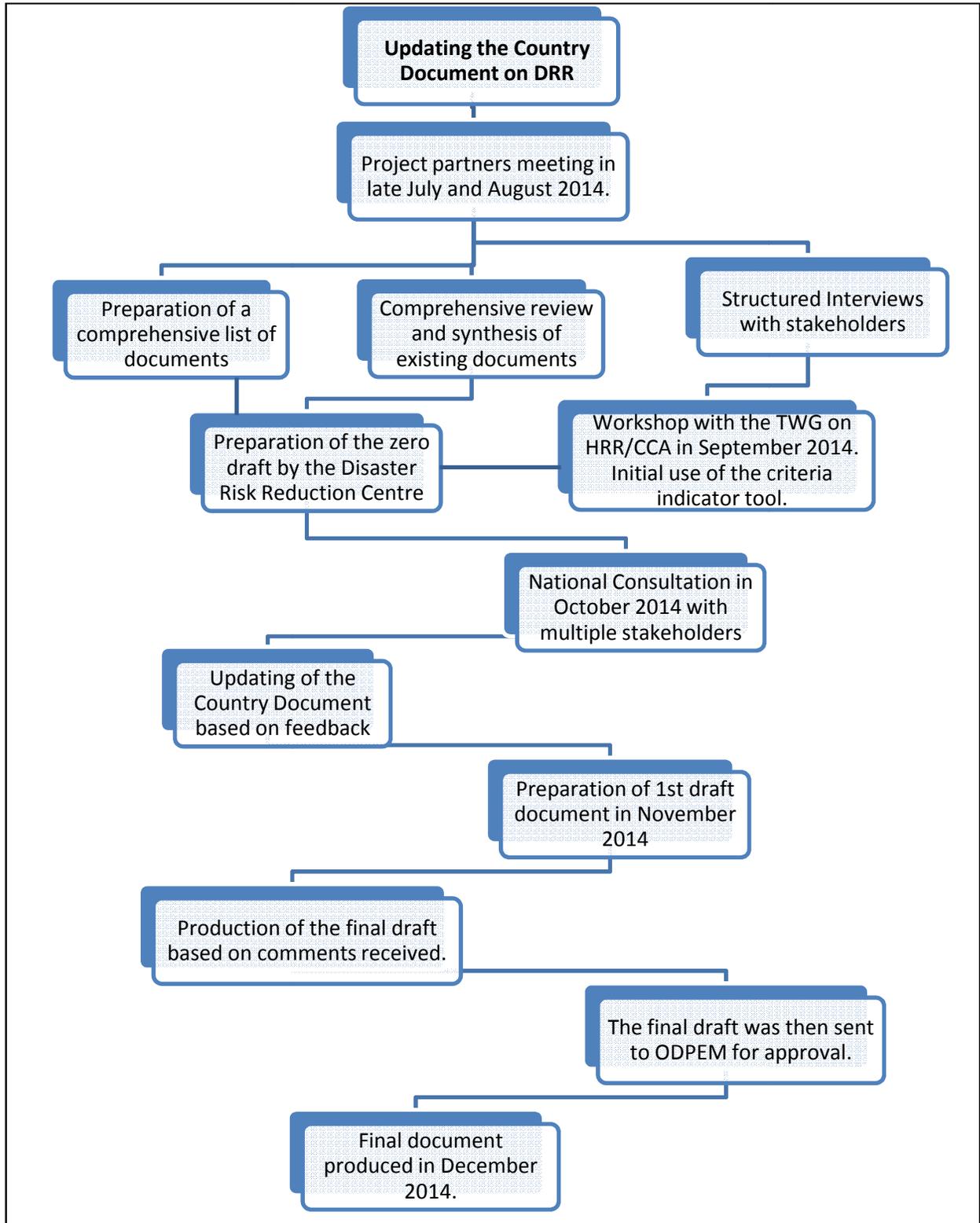


Figure 1.1: Process of updating the Country Document on DRR.

Limitations

Low turn-out of stakeholders, particularly at the national workshop reduced the level of participation which would have been desirable for a national document. Another limitation was the unavailability of some recent documents and reports on DRR which were yet to be approved. This lack of recent data and information limited the level of analysis, which could be done.

Acknowledgements

The authors wish to thank the stakeholders and agencies for their participation in the process of updating the Jamaica Country Document on Disaster Risk Reduction. The consultant also wishes to thank the Thematic Working Group on Hazard Risk Reduction and Climate Change Adaptation (HRRCCA) for the initial development of the “Criteria to identify Key Actions for Disaster Risk Reduction (DRR) Planning” and feedback on the Country Document (2012).

1. EXECUTIVE SUMMARY

Jamaica's location increases its vulnerability to multiple hazards including earthquakes, landslides, tropical cyclones, floods, droughts, tsunamis as well as oil and other hazardous materials spills. These hazards cause disasters that affect the lives of men and women, and have a negative impact on the country's development. Jamaica is especially vulnerable to hurricanes because of its location in the north Atlantic hurricane belt, but it is also within the seismically active northern boundary of the Caribbean Plate.

Several vulnerable groups have been identified in Jamaica, including children, youth-at-risk, the elderly, persons with disabilities (PWDs), women, and poor families. The list also includes both men and women living in rural communities, coastal zones and low-lying areas, people with poor housing and the homeless (UNDP 2009). It is estimated that persons at risk make up 60 per cent of Jamaica's total population and are generally vulnerable to storm surges, hurricanes and flooding, among other hazards⁶.

The higher level of poverty and increasing vulnerability to poverty of women are tied to their participation in the labour force typified by lower rates of employment and higher rates of unemployment in comparison to men (Senior and Dunn 2009). In the *Survey of Living Conditions* (2010), Jamaica registered a large percentage of female-headed households (FHHs) which stood at 47.1 per cent. FHHs with children and but no male present represented 55.3 per cent of FHHs (PIOJ 2011). Since 1993, Jamaica has recorded a high percentage of FHHs, increasing from 41.5 per cent to 43.5 per cent in 2002 to 46.7 per cent in 2006 (PIOJ 1998; PIOJ 2007a). FHHs are considered one of the most vulnerable groups in Jamaica (Senior and Dunn 2009). This indicates that gender needs to be taken into account in strategies which deal with reducing poverty. With higher levels of poverty, poor women are more vulnerable to the impact of natural hazards. They are also likely to bear the heaviest burdens when there are disasters.

Jamaica's institutional framework for Disaster Risk Reduction (DRR) was examined, including Agencies, Ministries and Parish Councils. Although there is a strong institutional framework, issues of inadequate human resources, unevenly distributed technical expertise and low funding were unearthed. There are several laws related to or supporting DRR, however enforcement is weak.

Jamaica's strategic interventions and priorities for DRR are documented in *Vision 2030 Jamaica*, and the strategies for achieving them are outlined. This is a key factor in integrating DRR into national development planning and demonstrates the government's recognition of the importance of DRR to national sustainable development.

The Hyogo Framework for Action (HFA) and Comprehensive Disaster Management (CDM) Strategy 2014-2024 are important supporting frameworks which link Jamaica's DRR programme with regional and international initiatives.

⁶(Senior and Dunn 2009; Working Group 1 Vulnerabilities and Capacities 2012)

The approach to reducing disaster risk in Jamaica has historically been more focussed on the study of hazards and introduction of mitigation measures in order to reduce the impact of these hazards. Until recently, very little work was done on measuring vulnerability. At national scale, the use of vulnerability indices is mentioned, as well as the ranking index used by ODPEM and sporadic use of the Community Vulnerability Assessment Tool (CVAT) method. However there is no systematic coordinated effort to research and understand the drivers of vulnerability in order to inform systematic reduction of vulnerability.

In order for DRR gains to be made, there must be an enabling framework. In this regard there are some encouraging signs of progress, such as the national development plan, *Vision 2030 Jamaica*, which includes DRR and Climate Change Adaptation (CCA) objectives and the inclusion of these in the Socio-economic Policy Framework. These are supported by the *Hazard Risk Reduction Policy* (draft) and the *Climate Change Policy and Action Plan*. The *Integrated Disaster Risk Management Action Plan*, still in draft, will operationalise DRR for the country, providing a road map by which multi-sector DRR initiatives can be pursued.

It can be concluded that there is recognition of the importance of DRR to achieving Jamaica's long term development goals; however the traditional constraints which have been documented frequently and are mentioned in this report – inadequate resources, low political will, weak governance to name a few – must be overcome in order for sustained progress to be made.

The Country Document was first completed in 2012, and is undergoing its first update in December 2014. New data have been incorporated into the update based on the availability of documents. The updated Country Document now has a new section on Criteria for Priority Indicators for DRR and was developed in conjunction with key stakeholders. Several strategies from *Vision 2030 Jamaica* and information from other reports were added as necessary.

2. ACRONYMS

ACDI/VOCA	Agricultural Cooperative Development International/Volunteers in Overseas Cooperative Assistance
ADRM	Agricultural Disaster Risk Management Plan
AFB	Adaptation Fund Board
API	Agricultural Production Index
AMO	Atlantic Multi-decadal Oscillation
CAP	Career Advancement Programme
CARDIN	Caribbean Disaster Information Network
CARICOM	Caribbean Community
CBDM	Community-Based Disaster Management
CBDRM	Community-Based Disaster Risk Management
CBOs	Community-Based Organisations
CCA	Climate Change Adaptation
CCCCC	Caribbean Community Climate Change Centre
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CDB	Caribbean Development Bank
CDEMA	Caribbean Disaster Emergency Management Agency
CDERA	Caribbean Disaster Emergency Response Agency
CDM	Comprehensive Disaster Management
CDMP	Caribbean Disaster Mitigation Project
CFLGM	Caribbean Forum of Local Government Ministries
CIMH	Caribbean Institute of Meteorology and Hydrology
CLLJ	Caribbean Low Level Jet
CPACC	Caribbean Planning for Adaptation to Climate Change Project
CRID	Regional Disaster Information Center for Latin America and the Caribbean
CRMI	Caribbean Risk Management Initiative
CSGM	Climate Studies Group Mona
CTII	Connectivity and Technology Infrastructure Index

ACRONYMS cont'd

CVAT	Community Vulnerability Assessment Tool
DDI	Disaster Deficit Index
DPEM Act	Disaster Preparedness and Emergency Management Act
DIPECHO	The European Commission Humanitarian Aid Department's Disaster Preparedness Programme
DM	Disaster Management
DRM	Disaster Risk Management
DRP	Disaster Relief Policy
DRR	Disaster Risk Reduction
DRRC	Disaster Risk Reduction Centre, UWI Mona
ECD	Environmental Control Division
EFF	Extended Fund Facility
EIA	Environmental Impact Assessment
EM-DAT	International Disaster Database
ENSO	El Niño/La Niña Southern Oscillation
EPI	Environmental Performance Index
EWS	Early Warning Systems
FAO	Food and Agriculture Organisation
FHH	Female-headed Households
GAR	Global Assessment Report
GCI	Global Competitive Index
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIR	Gross International Reserves
GIS	Geographic Information System
GOJ	Government of Jamaica
HACCP	Hazard Analysis Critical Control Point
HDI	Human Development Index
HSI	Hospital Safety Index
HFA	Hyogo Framework for Action

ACRONYMS cont'd

HM	Her Majesty
HRR	Hazard Risk Reduction
IDB	Inter-American Development Bank
IDNDR	International Decade for Natural Disaster Reduction
IMF	International Monetary Fund
UNISDR	United Nations Office for Disaster Reduction
IPCC	Inter- Governmental Panel on Climate Change
JCPD	Jamaica Council for Persons with Disabilities
JDF	Jamaica Defence Force
JIS	Jamaica Information Service
JSN	Jamaica Seismograph Network
KMA	Kingston Metropolitan Area
KSAC	Kingston and St. Andrew Corporation
LDI	Local Disaster Index
LSS/SUMA	Logistics Support System/Supply Management
MACC	Mainstreaming Adaptation to Climate Change
MDG	Millennium Development Goal
MGD	Mines and Geology Division
MGI	Mona Geoinformatics Institute
MMI	Modified Mercalli Intensity
MP	Member of Parliament
NCDs	Non-communicable Chronic Diseases
NYCD	National Centre for Youth Development
NDC	National Disaster Committee
NDCHD	National Disaster Catalogue and Hazard Database
NDF	National Disaster Fund
NDO	National Disaster Organisation/Office
NDP	National Disaster Plan
NIE	National Implementing Entity

ACRONYMS cont'd

NIR	Net International Reserves
NIS	National Insurance Scheme
NEOC	National Emergency Operations Centre
NEPA	National Environment and Planning Agency
NGOs	Non-Governmental Organisations
NHRP	National Hazard-Risk Reduction Policy
NAO	North Atlantic Oscillation
NOAA	National Oceanic and Atmospheric Administration
NPP	National Physical Plan
NRCA	National Resources Conservation Authority
NSP	National Spatial Plan
NSS	National Settlement Strategy
NSWMA	National Solid Waste Management Authority
NWA	National Works Agency
NWC	National Water Commission
NYS	National Youth Service
OAS	Organisation of American States
OECS	Organization of Eastern Caribbean States
ODPEM	Office of Disaster Preparedness and Emergency Management
PAHO	Pan-American Health Organisation
PATH	Programme for Advancement through Health and Education
PCDPPP	Pan-Caribbean Disaster Preparedness and Prevention Project
PDCs	Parish Development Committees
PEOC	Parish Emergency Operations Centre
PDICs	Parish Disaster Committees
PFA	Priority for Action
PIOJ	Planning Institute of Jamaica
PVI	Prevalent Vulnerability Index
PPCR	Pilot Programme on Climate Resilience

ACRONYMS cont'd

PWD	Persons with Disabilities
RMI	Risk Management Index
SDR	Special Drawing Rights
SIDS	Small Island Developing States
STATIN	Statistical Institute of Jamaica
UDS	Unit for Disaster Studies
UNDP	United Nations Development Programme
UNECLAC	United Nations Economic Commission for Latin America and the Caribbean
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UWI	University of the West Indies
USA	United States of America
WRA	Water Resources Authority
YIC	Youth Information Centres

3. INTERNATIONAL AND REGIONAL DISASTER RISK REDUCTION CONTEXT

The United Nations *Global Assessment Report on Disaster Risk Reduction (GAR)* 2011 shows that global exposure to weather-related hazards is increasing. Table 3.1 shows increase in exposure to floods by region for the period 1970 – 2010. Overall on a global scale, exposure has doubled during this period.

Region	1970	1980	1990	2000	2010
East Asia and the Pacific (EAP)	9.4	11.4	13.9	16.2	18.0
Europe and Central Asia (ECA)	1.0	1.1	1.2	1.2	1.2
Latin America and the Caribbean (LAC)	0.6	0.8	1.0	1.2	1.3
Middle East and North Africa (MENA)	0.2	0.3	0.4	0.5	0.5
OECD countries (OECD)	1.4	1.5	1.6	1.8	1.9
South Asia (SAS)	19.3	24.8	31.4	38.2	44.7
Sub-Saharan Africa (SSA)	0.5	0.7	1.0	1.4	1.8
World	32.4	40.6	50.5	60.5	69.4

Table 3.1: Flood exposure by World Bank region as modeled (million people per year). Source: GAR 2011.

Table 3.2 shows exposure to tropical cyclones by region for 1970 - 2009. The pattern is similar. Note that for Latin America and the Caribbean, exposure to tropical cyclones has increased five-fold during the review period. The average annual number of events has not shown a similar trend – for 1970 – 2009, the number of Category 1 and 2 storms has been decreasing while the number of Category 4 and 5 storms has been increasing. The GAR interprets increasing exposure as being related to patterns of population growth and development, rather than any significant increase in the frequency of the hazard.

Region	1970–1979	1980–1989	1990–1999	2000–2009
East Asia and the Pacific (EAP) ¹¹	36.6	42.2	44.3	53.7
Latin America and the Caribbean (LAC)	1.1	1.6	1.2	5.2
Middle East and North Africa (MENA)	0.0	0.0	0.0	0.1
OECD countries (OECD)	26.2	27.2	39.7	53.2
South Asia (SAS)	1.5	7.8	11.1	7.6
Sub-Saharan Africa (SSA)	0.5	0.9	1.5	2.7
World	65.9	79.8	97.8	122.5

Table 3.2: Exposure to tropical cyclones by World Bank region as modeled from observed events (in million people per year). Source: GAR 2011.

The GAR also shows that globally, mortality risk for floods and cyclones has decreased since 2000, despite the increase in exposure. It should be noted that this is not true for every country in the analysis. The overall reduction in mortality risk no doubt reflects the improvements in early warning systems and preparedness, which have contributed to a welcome reduction in casualties.

However, for the same review period, economic loss risk has increased. Additionally, the average annual global GDP exposed to floods and cyclones has increased in every region. For Latin America and the Caribbean, the GDP exposure has increased by a factor of ten (Table 3.3).

Region	1970–1979	1980–1989	1990–1999	2000–2009
East Asia and the Pacific (EAP)	16.0	25.3	39.5	90.2
Latin America and the Caribbean (LAC)	2.3	4.9	3.7	24.3
Middle East and North Africa (MENA)	0	0	0	1.0
OECD countries (OECD)	506.6	665.1	1,247.1	1,455.0
South Asia (SAS)	0.3	2.6	4.2	4.3
Sub-Saharan Africa (SSA)	0.5	1.1	1.3	1.7
World	525.7	699.0	1,295.8	1,576.5

Table 3.3: Average annual global GDP exposed to cyclones from observed events (in billion 2000 US\$). Source: GAR 2011.

Although floods and tropical cyclones are treated here, increasing exposure is a fact for several hazards, including earthquakes and droughts. The general conclusion that can be drawn is that unless countries successfully implement risk reduction measures, national development will continue to be compromised and Millennium Development Goals (MDGs) such as poverty eradication and improved health will not be achieved. The continued failure to reduce risk has been attributed variously to weak governance systems and failure to address underlying risk drivers and failure to address vulnerability (GAR 2011).

Tracking of global progress in DRM/DRR is done by review of country reports on the Hyogo Framework for Action (HFA) Monitor, an on-line tool which can be completed by countries and uploaded. Over 100 countries used the Monitor to report progress using a self-evaluation method in 2007-2009 (GAR 2011).

The 2011 review shows that, generally, countries are finding it difficult to carry out comprehensive assessments of risk and to integrate risk assessment into national development and planning decisions. However, reporting for 2011 indicates an improvement across all priority areas although addressing underlying risk factors seems to be the most challenging of the priority areas. Significantly, the 2011 report reveals that financial mechanisms for disaster management are generally weak, with few countries

having contingency funds, particularly at the local level. Fewer than half of the reporting countries indicated comprehensive multi-hazard risk assessments, with the major reasons being limited financial resources, lack of technical capacity and a lack of harmonization of instruments, tools and institutions involved in risk assessments (GAR 2011).

The full scale of disaster losses is still not fully understood despite efforts globally. *“Between 2001 and 2011, global reinsurer Munich Re. reported about US\$1.68 trillion in losses, a calculation based on insured losses and estimates of insurance market penetration. Over the same period, the International Disaster Database (EM-DAT), reported US\$1.25 trillion in losses”* (GAR 2013, p. 38). As such, neither provides a complete picture of global disaster losses, as none accounts for uninsured losses associated with recurrent, smaller-scale, extensive disasters, especially in low and middle-income countries.

3.1 INTERNATIONAL FRAMEWORK

The Jamaican DRM programme is developed within the context of Comprehensive Disaster Management (CDM) as well as the global Hyogo Framework for Action (HFA) which established five Priorities for Action (PFAs) in order to achieve reduction in disaster risk globally:

- PFA 1 - Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation
- PFA 2 - Identify, assess and monitor disaster risks and enhance early warning
- PFA3 - Use knowledge, innovation and education to build a culture of safety and resilience at all levels
- PFA4 - Reduce the underlying risk factors
- PFA5 - Strengthen disaster preparedness for effective response at all levels.

Jamaica has not established a separate national platform for the HFA as the National Disaster Committee acts as the national focal point for all DRM matters. Jamaica regularly reports on progress in CDM and HFA.

The successor framework to HFA 2005 - 2015, currently called HFA2, is being developed through a series of national and regional consultations and two global preparatory meetings. The HFA2 Zero Draft version⁷ states as the ultimate Outcome *“the substantial reduction of disaster losses in lives and in the social economic and environmental assets of persons, communities and countries”*. In order to achieve this outcome it will be necessary to prevent disaster risk creation, reduce existing disaster risk, reduce exposure and vulnerability and increase resilience. The draft document sets

⁷ http://www.wcdrr.org/preparatory/post2015#anchor_a (November 2014)

out guiding principles, global targets, priorities for action from local to global levels. The importance of global partnerships, business, academia, science and innovation, as well as children, youth, elderly, women, persons with disabilities and indigenous peoples in achieving the outcome is recognized. Of note is the call to the United Nations system, bi-lateral partners and donor organisations to ensure that DRR is included in all development programming. HFA2 will be presented for acceptance at the World Conference on Disaster Reduction in Sendai, Japan, in 2015.

3.2 REGIONAL FRAMEWORK

Jamaica is a Participating State of the Caribbean Disaster Emergency Management Agency (CDEMA) which coordinates DRM on behalf of the Caribbean Community (CARICOM). CDEMA coordinates CARICOM's regional DRM strategy – *The Comprehensive Disaster Management Strategy (CDM)*, which has recently been revised for the period 2014 - 2024. The goal is: “*To strengthen regional, national and community level capacity for mitigation, management, and coordinated response to natural and technological hazards, and the effects of climate change*” (CDEMA 2014).

The purpose is to strengthen regional, national and community level capacity for mitigation, management, and coordinated response to natural and technological hazards, including the effects of climate change by:

1. Increasing national, regional and sectoral institutions capacity and standards to deliver the CDM program;
2. Enhancing the application of knowledge management for fact-based decision-making;
3. Enhancing disaster resilience within key sectors of the economy;
4. Improving operational readiness at regional, national, sectoral and local levels;
5. Harmonizing a clearly established and understood nexus between CCA and DRR with programming and governance;
6. Enhancing community resilience for the most vulnerable with gender concerns addressed at all stages and levels;
7. Underpinning the plan with an adequate resource allocation framework which improves the ability to deliver the strategy

There are four Outcomes which are supported by CARICOM Member States as outlined below:

- i. Outcome 1 - Strengthened institutional arrangements for Comprehensive Disaster Management implementation at national and regional levels

- ii. Outcome 2 - Increased and sustained knowledge management and learning for Comprehensive Disaster Management
- iii. Outcome 3 - Improved effectiveness of CDM at sectoral levels
- iv. Outcome 4 - Strengthened and sustained capacity for a culture of safety and community resilience in Participating States

The framework includes the cross cutting themes of climate change, gender, information and communications technology (ICT) and environmental sustainability which are to be included in regional, national and sectoral programming. The 2014 – 2024 CDM Framework (CDEMA 2014) recognizes the importance of physical and environmental planning, and Finance and Development which are identified as ‘*emerging priority sectors*’ (Figure 3.1). It emphasises enhanced public private partnership, integrated risk management including climate change considerations. It also takes into account the region’s commitment to global and regional frameworks and agreements such as: the Millennium Development Goals (MDGs) – the CDM Framework is stated as a platform for further advancement of the MDGs and for measuring and reporting on progress.

The CDM Framework places emphasis on several of the principles articulated in the Rio + 20 Agenda including recognition of vulnerable groups, livelihoods, gender and climate change as well as integration, stakeholder engagement, strengthening of institutional frameworks and the strengthening of intergovernmental arrangements.

The *CARICOM Regional Framework 2005 – 2015* – links into the CDM Framework through its inclusion of hazard mapping, vulnerability assessments, community based disaster risk management (CBDRM), climate change and knowledge management.

The *Organization of Eastern Caribbean States (OECS) St George’s Declaration of Principles for Environmental Sustainability* – the Framework links to Principle 9 of the Declaration: “*Governments will integrate disaster management initiatives with environmental priorities to help the peoples of the region in their preparation for and management of the impacts of natural and man-made disasters.*”

The CDM Framework 2014 – 2024 is accompanied by a performance measuring framework and implementation plan, reflecting the increasing emphasis on objective measurement of progress in disaster risk management. The work programmes of member states are aligned to the CDM Strategy, which provides a coherent framework for all DRM programmes in CARICOM. CDEMA has initiated a number of projects related to climate change adaptation (CCA) and DRR. These include production of a video on CCA under a climate change and DRR project, as well as a ‘*Guidance Tool for Mainstreaming Climate Change Adaptation into National CDM Work Programmes*’. This Guidance Tool is meant to lead to the development of work programmes, which would include climate change considerations (Walling, Brown and Smith, 2011).

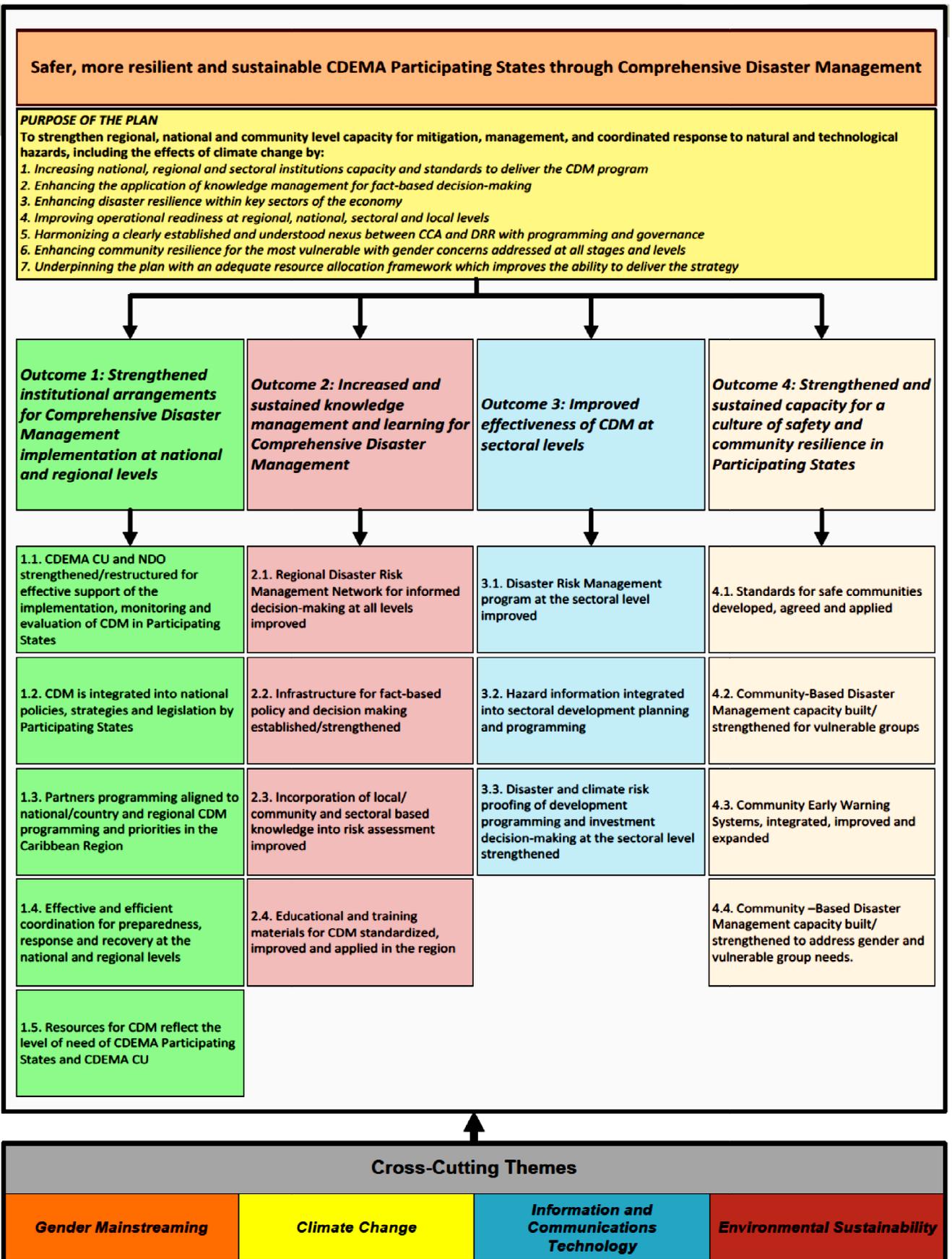


Figure 3.1: Logic Model for the CDM Strategy outlining the plan's purpose and cross cutting themes. Source: CDEMA 2014.

The Caribbean has emphasised the importance of planning for climate change for several years. CARICOM established the Caribbean Community Climate Change Centre (CCCCC) in Belize in 2005 to coordinate and direct climate change efforts. In 2009 the *Regional Climate Change Strategic Framework for Achieving Development Resilient to Climate Change* was endorsed by CARICOM Heads who decided that the CCCCC should then develop an implementation plan for the strategy across the region. The implementation plan provides a base for development of projects by governments for funding under climate change initiatives, including the *United Nations Framework Convention on Climate Change* (UNFCCC). Jamaica has completed and submitted its *First and Second National Communications on Climate Change*. Jamaica recently started the process of producing its *Third National Communications on Climate Change*.

The *Regional Framework for Achieving Development Resilient to Climate Change 2009 - 2015* with the strategic vision of a regional economy and societies that are resilient to a changing climate complements the vision of the CDM Framework 2014 – 2024. This framework provides a roadmap for action for regional institutions and countries in climate change for 2009 - 2015, and builds on previous work by the CCCCC, regional governments, academia and NGOs in climate change and climate change adaptation.

Four key strategies are enunciated:

1. Mainstreaming climate change adaptation strategies into sustainable development strategies of CARICOM States;
2. Promoting actions to reduce greenhouse gas emissions through energy efficiency, conservation and switching to renewable energy sources;
3. Encourage action to reduce vulnerability of natural and human systems in CARICOM countries to the impact of a changing climate; and
4. Promoting action to derive social economic and environmental benefits through the prudent management of standing forests in CARICOM countries.

Specific roles are envisaged for governments, the private sector, civil society, and regional organisations, including the CCCCC, and the international community. Importantly, the framework envisages that the financing of disaster risk reduction initiatives will be treated as a development priority within the budgeting process, and that all government entities will advance the goals and objectives of the framework by ensuring that disaster risk reduction is taken into account in the design of development programmes and projects. It proposes establishing a Natural Hazard Risk Management Fund to finance prospective disaster risk management initiatives.

In March 2012, the Heads of Government of CARICOM approved *'Delivering Transformational Change 2011 – 2021'* which is the Implementation Plan for the *'Regional Framework for Achieving Development Resilient to Climate Change'*. The document:

- i. Seeks to guide the identification and prioritisation of actions by regional and national stakeholders under each strategic element and goal area of the Regional Framework through the use of risk management approaches to decision making;

- ii. Considers responsibilities and functional co-operation between regional organisations and national governments;
- iii. Recognises that there are existing significant resource and capacity challenges that hold back the region's sustainable development and growth and proposes building on a process known as the 'three-ones' to assist in resource mobilisation and co-ordination of actions; and
- iv. Proposes a monitoring and evaluation (M&E) framework

The Implementation Plan will be reviewed and modified as knowledge of climate science, access to funding, technical skills and human resource capacity and economic conditions change over time. A biennial review of the Regional Framework and Implementation Plan, coordinated by the CCCCC is planned.

4. NATIONAL CONTEXT

4.1 PHYSICAL ENVIRONMENT

4.1.1 GEOGRAPHIC LOCATION

Jamaica is located in the Northern Hemisphere at latitude 18 degrees North and 77 degrees West within the Caribbean which is characterized by an archipelago (a group of islands) which extends from southeast of the United States of America (USA) to northern South America (Map 4.1). Jamaica is surrounded by the Caribbean Sea within the Greater Antilles, which includes Cuba, Puerto Rico and Hispaniola (Dominican Republic and Haiti). Jamaica's closest neighbours are Cuba 140 km to the north and Haiti 19 km to the east.



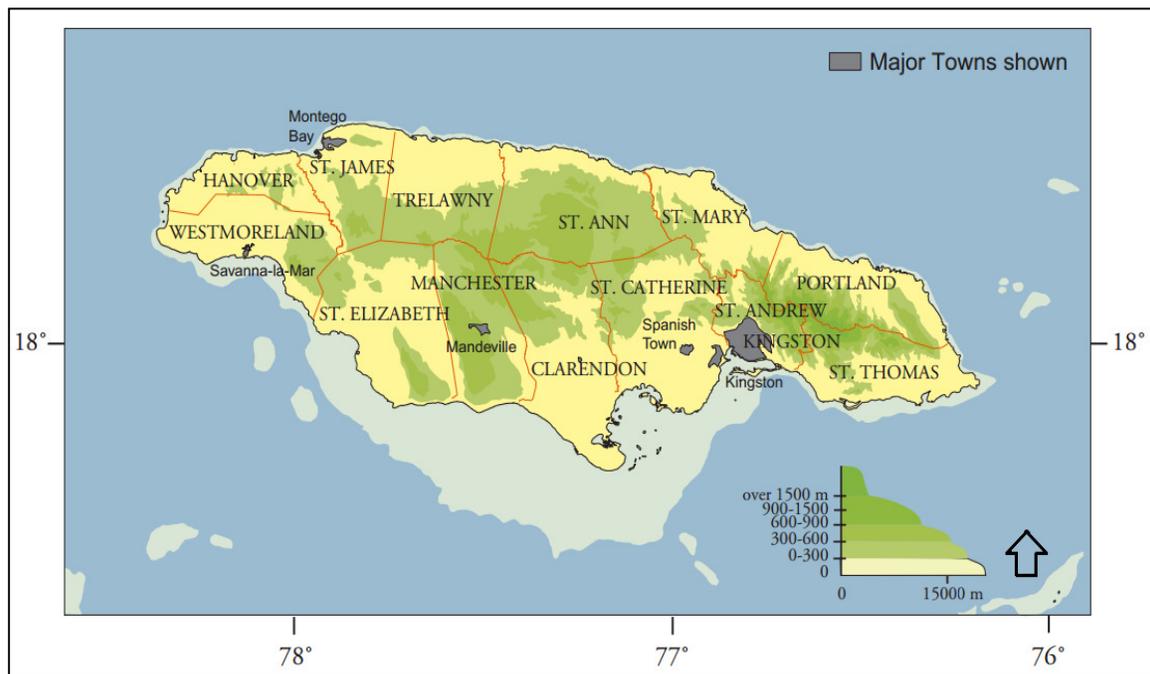
Map 4.1: Map of the Caribbean. Source: CDC 2014.

Jamaica is the third largest island in the Caribbean, after Cuba and Hispaniola, with an area of 10,940 square kilometers. The island is 236km in length and 35-82 km in width (Richards 2008). The island is divided into fourteen parishes which are grouped by counties namely Cornwall (western parishes), Middlesex (central parishes) and Surrey (eastern parishes).

4.1.2 PHYSIOGRAPHY

Jamaica's topography consists of coastal and inland plains, limestone features (such as plateaus, conical hills and natural depressions) and high interior mountain ranges which extend across the island from east to west (Map 4.2). The extent of the coastal plains varies in width as those located on the eastern and northern parishes are quite narrow (less than 1km).

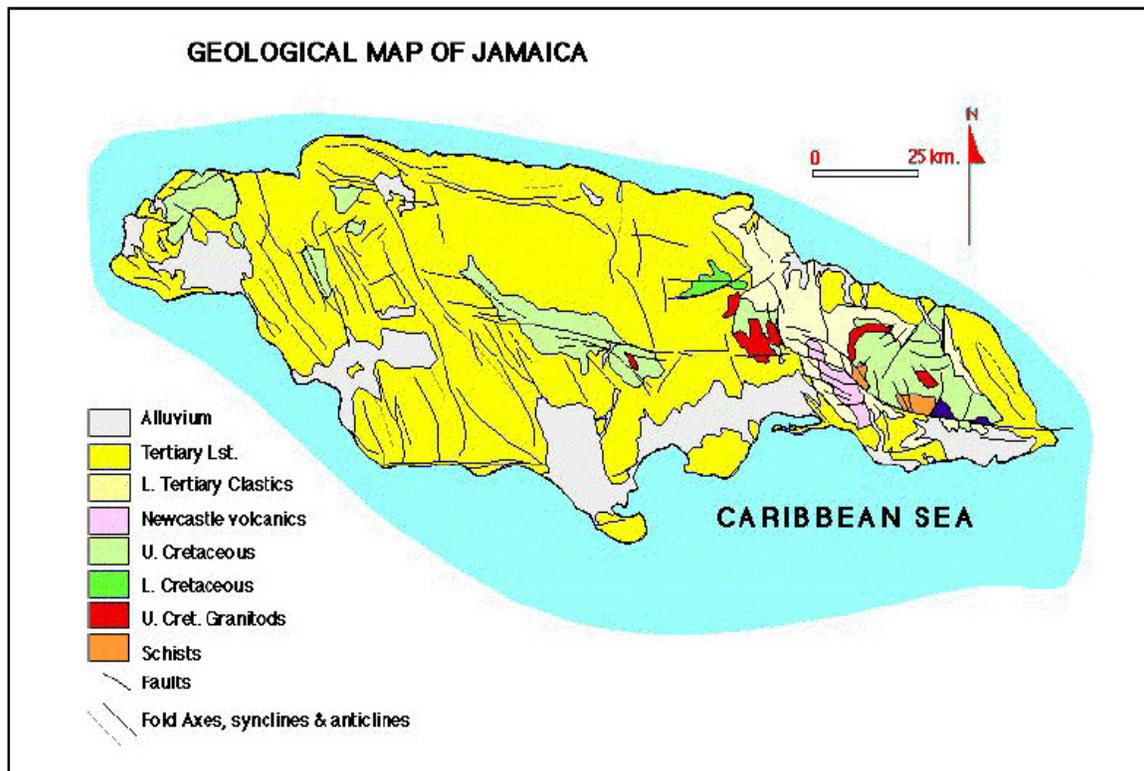
The Blue Mountain Peak, in the eastern section of the island, is the highest point at 2,256 meters. More than one-half of the country is at least 305 meters above sea level and over one-half of the land has slopes over 20 degrees (Smith 2007).



Map 4.2: Political boundaries, major towns and topographic elevation of Jamaica. Source: Edited from CFRAMP 2000.

The geology of Jamaica influences both the landscape and drainage patterns across the island. The aquifer rock, or group of rocks, allows for the movement and storage of groundwater but aquiclude rock or groups of rocks does not allow for such movement of water⁸ (Map 4.3). On the island rainfall is usually transported or stored in surface channel or underground systems. Throughout the year, the flow of surface channels is dependent on rainfall intensity and seasonality. During periods of low rainfall the surface channels experience a reduction in base flow. The permeable zones act as a reservoir for rainfall after which water will flow into surface and sub-surface rivers.

⁸ <http://www.wra.gov.jm/dynaweb.dti?dynasection=general&dynapage=hydrology>

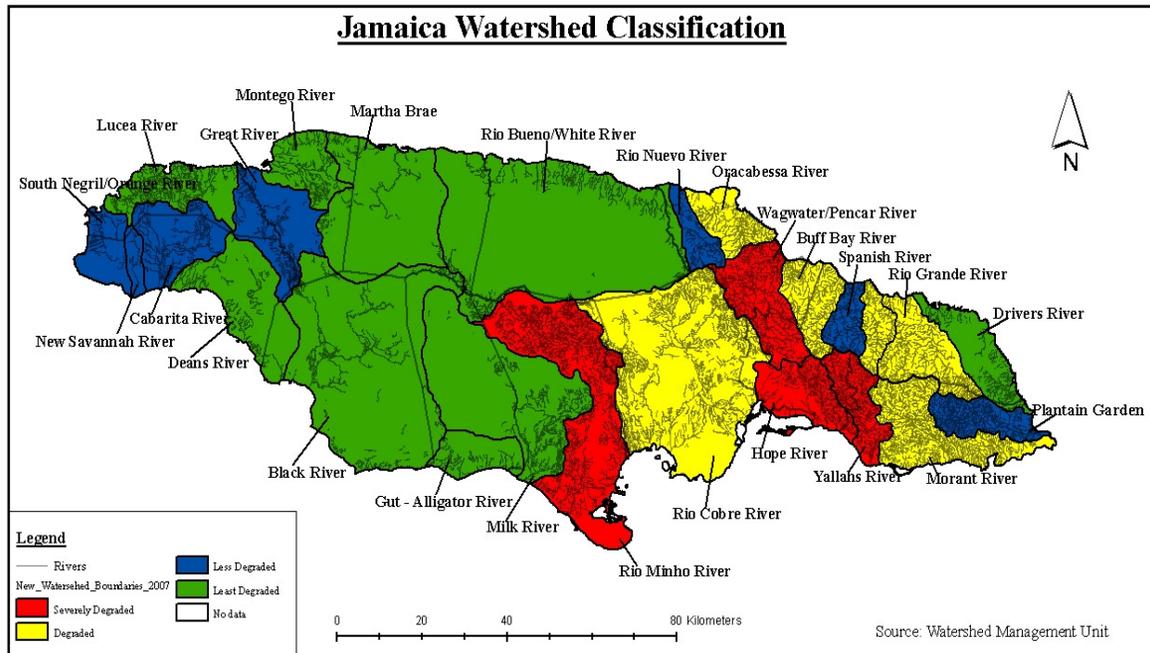


Map 4.3: Geological Map of Jamaica. Source: Ahmad undated.

In Jamaica, the rivers originate from the hilly interior and flow in a northerly or southerly direction. Only the Plantain Garden River in St. Thomas flows in an easterly direction. The rivers and tributaries constitute a major feature of Jamaica's hydrology and are located within the various watersheds.

The island is divided into ten Hydrological Basins which are usually delineated by basin boundaries from the main surface water divides while in other cases the basin boundaries may also be defined by the groundwater divides. In the limestone region, sinkholes and caverns are common and play a vital role in the transfer of surface water into the underground system. Notably, these hydrologic features are sources of flooding across Jamaica when the capacities of such features are exceeded.

There are 25 watersheds across Jamaica; these vary significantly from east to west in their state of degradation (Map 4.4). Most of the degraded watersheds are located in the eastern section of the island and serve more than half the country's population. The Hope River, Wag Water River, Yallahs River and Rio Minho River watersheds are the most degraded (Map 4.4).



Map 4.4: Jamaica Watershed Classification. Source: WMU 2007.

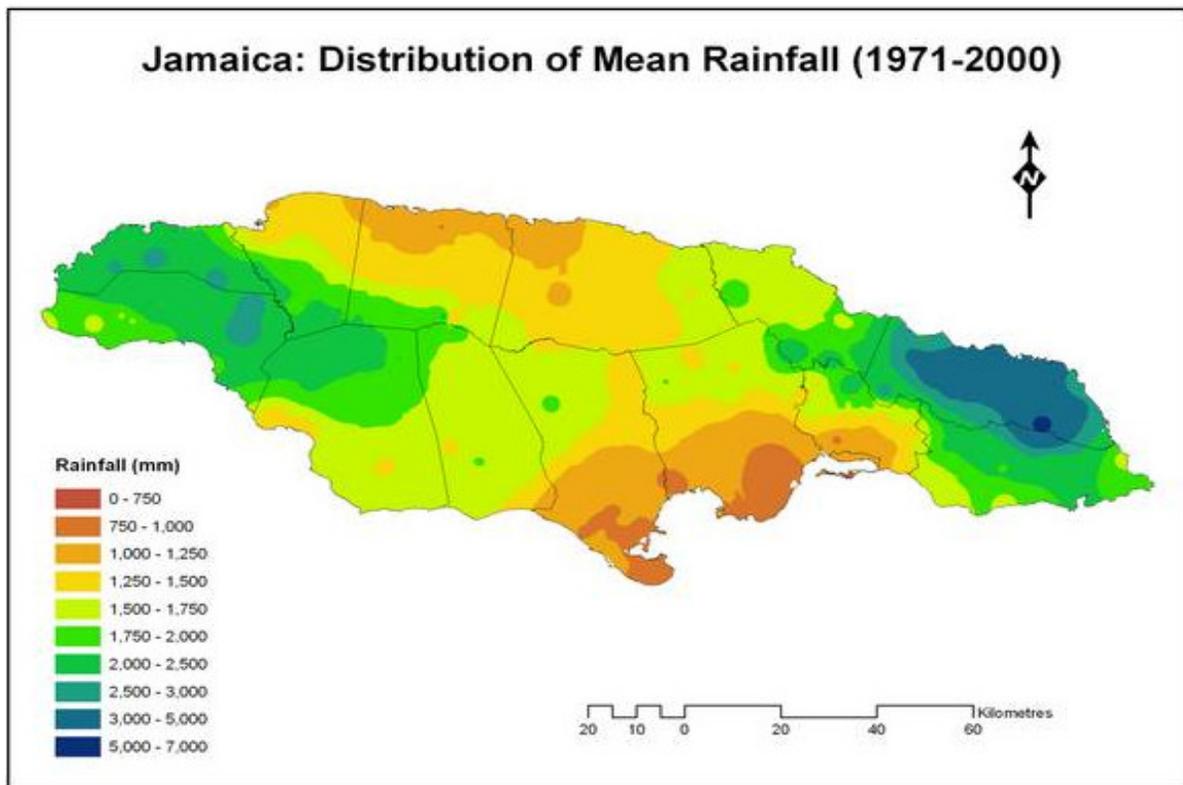
The morphology of Caribbean islands share comparable characteristics as a result of the geologic formation of the region. As such, the montane streams of the Greater Antilles share several morphological characteristics (Ahmad et al. 1993). The streams in their headwaters flow in narrow valleys with steep gradients while transporting and depositing sediments such as pebbles, coarse materials and boulders downstream. In the lower sections of the stream, multiple channels and depositional surfaces occur at varying locations within the valley floor (Ahmad et al. 1993). Floodplains are a common feature in the middle and lower courses of the river due to the location of fairly flat land. Flooding may occur in these areas if the channel is not able to facilitate the volume of runoff over a short period of time or steady rainfall over long periods.

4.1.3 CLIMATE

Jamaica has a tropical maritime climate with tropical weather influenced by the prevailing northeast trade winds. There is little variation from one season to the next; however July and August are two of the hottest months while December and January are two of the coolest months. Temperatures are normally consistent throughout the year but will vary in different parts of the island “from a seasonal low of 26°C in February to a high of 30°C in August; on average, the temperature changes by 2°C with every 300m change in altitude⁹.” However, future projections for climate change are forecasting warmer day and night temperatures. See Section 6.2 for more information on climate change projections.

⁹ <http://www.wra.gov.jm/dynaweb.dti?dynasection=general&dynapage=hydrology>

Rainfall varies seasonally and spatially, thus influencing different ecosystems across the island. In general, most of the rainfall occurs as relief rainfall in the hilly interior due to the orography of the island. The island receives an annual average range of 5,080mm - 6200mm from high rainfall regions especially in Portland. The long term mean annual rainfall is 1,981mm¹⁰. High rainfall levels are concentrated over the Blue Mountains while most of the south coast is located in the rain shadow region and receives less rainfall than the north coast of the island (Map 4.5). The annual rainfall pattern for Jamaica exhibits two marked bi-modal peaks with the primary maximum in October and secondary maximum in May. The drier months are January, February, March and July where rainfall is at its minimum. The island's rainfall pattern may be influenced by tropical storms and hurricanes during the hurricane season (June to November) or other synoptic weather systems (frontal systems, troughs, etc.) which may produce high intensity and/or prolonged rainfall.



Map 4.5: Rainfall Map of Jamaica (1971-2000). Source: Meteorological Services of Jamaica.

¹⁰ <http://www.wra.gov.jm/dynaweb.dti?dynasection=general&dynapage=hydrology>

4.2 SOCIO-ECONOMIC CONTEXT

4.2.1 POPULATION and DEMOGRAPHICS

Jamaica's total population in 2013 stood at 2,718,000, of this total 1,345,500 were males representing 49.5 per cent and 1,372,500 were females representing 50.5 per cent of the total population. The sex ratio showed very little variation, in 2013 it stood at 98.0 males per 100 females compared with 97.9 males to 100 females in 2012. In 2012 Jamaica's total population was 2,711,476 with 1,341,700 males and 1,369,776 females while in 2011 Jamaica's total population stood at 2,697,983; of this total 1,363,450 were females and 1,334,533 males. The younger working age population, ages 15-44 years represented 1.3 million persons (48 per cent) an increase of over 80,000 persons. The older working population, ages 45-64 years, increased by 36 per cent from 352,861 in 2001 to 480,240 in 2011. In addition, the older working population ages 45-64 years accounted for 18 per cent of the total population in 2011 (STATIN 2012, PIOJ 2014).

Below is a population pyramid which shows the age and sex structure of Jamaica's population. The population is distributed along the horizontal axis, with males shown on the left and females on the right.

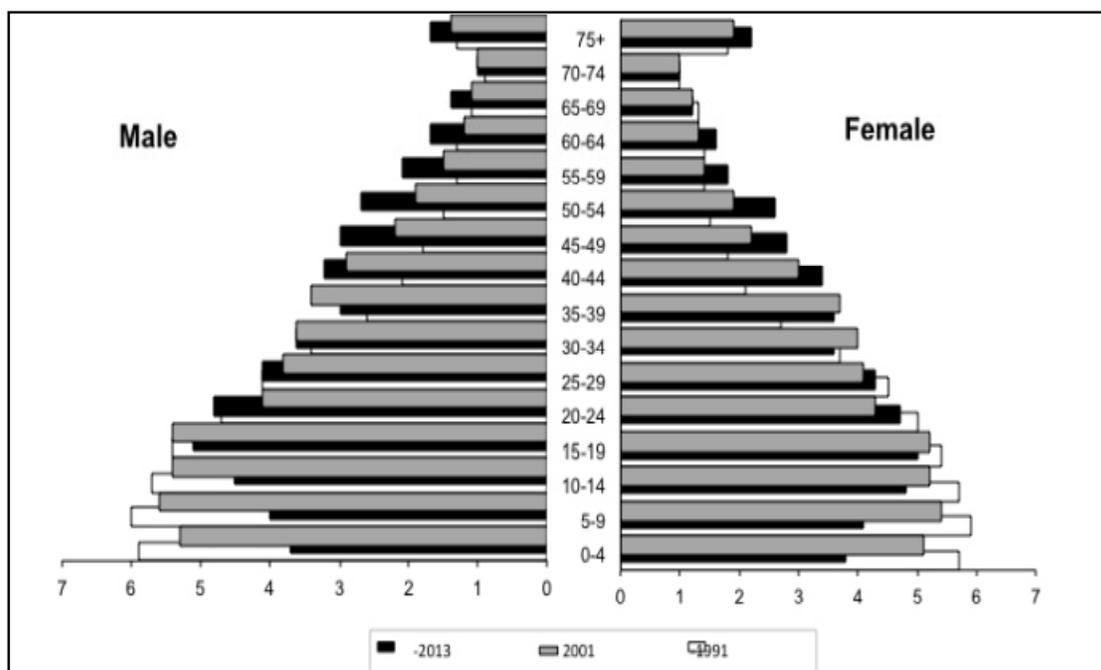


Figure 4.1: Jamaica's population by age and sex, Census 1991, 2001 and 2013 estimates. Source: PIOJ 2014

Jamaica is at the intermediate stage in the demographic transition characterized by decreasing birth rates and low death rates, and displays the following features (STATIN 2008, PIOJ 2014):

- a. a declining 0-14 age group from 27.4 per cent in 2009 to 27.3 per cent in 2010 to 24.0 per cent in 2013; this group is expected to continue to decline over the next twenty (20) years to 23.2 per cent by 2030 (STATIN 2008, PIOJ 2014);
- b. an increase in the working population aged 15-64, there is a projected increase to 66.8 per cent by 2020 but it is expected to decline afterwards. For 2013 the working age population increased to 1,832,500 persons or 67.4 per cent of total population;
- c. persons in the 15-39 age range made up the highest proportion of workers in this 15-64 age category;
- d. the over 60s group which is divided into two groups - the elderly population (60+) and the 'dependent elderly' aged (65+). This latter group represented 8.5 per cent of the total population in both 2009 and 2010 while in 2013 they represented 8.6 per cent or 233,200 persons;
- e. the elderly population, (60+), stood at 11.1 per cent of the total population in 2010 at 299,500 (of this total 163,900 were females and 135,600 males) an increase from 11 per cent or 298,100 in 2009. The trend continued with the group representing 11.7 per cent of total population in 2012 increasing to 11.9 per cent or 323,500 of the total population in 2013. The over 60 age group (made up of the 60+ and the 65) is expected to continue to increase up to 2050.

The 2011 census and 2013 estimates confirmed that the ageing population of Jamaica continues to increase (Figure 4.1). Of the total population persons 15 years or under declined to 26 per cent, down from 41 per cent in 1960. For the same period those from the 65 years and over group increased from 4.35 per cent to 8.1 per cent. Further evidence of ageing, is the change in average age - in 1970 the median age for men and women was 16 and 18 years respectively. In 2011 the median age for men had increased to 27 years and for women 28 years (STATIN 2012). Jamaica recorded its lowest annual growth rate of 0.2 per cent in 2013 and its lowest net population growth of 6,600 in 15 years. The ageing of Jamaica's population will impact the labour market, and issues of education, health and social security must be dealt with (PIOJ 2014). Similar, the ageing population will have serious implications for effective DRM especially in the areas of preparedness and response as the population becomes more dependent on receiving care.

Migration

Another issue that impacts Jamaica's population is emigration. Every year for the last forty years, more than 25,000 persons have emigrated from Jamaica to the USA, Canada and the United Kingdom. This has reduced Jamaica's population growth by 40 per cent each year (PIOJ 2012). In 2013 Jamaica was ranked 11th worldwide and 3rd in Latin America and the Caribbean based on the number of emigrated persons (PIOJ 2014).

Health

Jamaica's overall health status is good. The life expectancy in Jamaica increased slightly from 72.7 years in 2010 and 2012 compared to 73.1 years in 2013 (PIOJ 2012; PIOJ 2014). In general the health of Jamaicans has shown improvement over the last few

decades (PIOJ 2014). Additionally, among developing countries Jamaica ranks high with respect to the health status of its population (*ibid*) as figures below demonstrate.

The island has a good primary health care record and can share a number of best practices in this area. However, financing at both affordable and concessionary rates is needed to stimulate renewal of the primary care model and other support, including partnerships with educational institutions to build capacity and expand the training of health personnel. As a result of migration of qualified health professionals Jamaica has been hit with chronic staff shortages in some areas of health care (PIOJ 2009c).

Jamaica has made progress in eight (8) out of the fourteen (14) MDG targets for 2015 including the targeted reduction in malnutrition and hunger, combating HIV/AIDS, stopping and reducing malaria and tuberculosis outbreaks, access to reproductive health services, and provision of basic sanitation and safe drinking water. However, more needs to be done in order to achieve infant and maternal mortality targets, which remain a cause for concern. Despite Jamaica's progress with respect to most health indicators, there continues to be public dissatisfaction with the public health care system (PIOJ 2009c; PIOJ 2012).

According to the *Economic and Social Survey of 2013* the status of key health indicators in Jamaica were as follows:

- a. Life expectancy (at birth) – 73.1 years in 2013
- b. Infant Mortality – 16.7/1,000 live births in 2013
- c. Crude birth rate – 13.5/1,000 in 2013
- d. Crude death rate – 5.7/1,000 in 2013
- e. Total fertility rate – 2.4/1,000 in 2013
- f. Maternal Mortality Rate – 94.4/100,000 in 2013
- g. Immunization coverage:
 - o DPT,OPV, BCG 0-11 months – 90.64 per cent in 2013
 - o MMR 12-23 months – 94.0 per cent in 2013

The main causes of mortality and morbidity are chronic non-communicable diseases (NCDs) such as hypertension, cardio-vascular conditions, diabetes, obesity, some cancers and various lifestyle practices such as tobacco smoking, substance abuse, violence, injuries and mental illness. PIOJ 2014 notes that chronic non-communicable diseases such as diabetes, hypertension, cardiovascular diseases and obesity became more prevalent and were the major cause of illnesses and death in Jamaica over the last 10 years. As indicated by 2013 data from the Ministry of Health (MOH), Jamaica's public health burden has increased due to the increase in sickle cell disease, mental health disorders and violence-related and other types of injuries. Further, in 2012 cerebrovascular disease, diabetes mellitus, malignant neoplasm of the prostate, ischaemic heart disease and external causes (mainly assault, transport accidents and falls) were the five leading causes of death for Jamaican men. For women the top five leading causes of death were hypertensive diseases, diabetes, cerebrovascular disease, ischaemic heart disease along with other types of heart diseases (PIOJ 2014).

Despite the progress made, globalisation has increased the threat of infectious diseases in Jamaica. Examples are the 2007 Malaria and the 2014 Chikungunya outbreaks. However, according to PIOJ (2014, p. XIV) "*Jamaica has progressed in achieving health-related targets of halting the spread of HIV/AIDS, Malaria and Tuberculosis (TB).*" The re-implementation of the Malaria Re-elimination Programme and the implementation of the WHO Framework Convention on Tobacco Control were accomplished.

Jamaica also became a party to the WHO Framework Convention on Tobacco Control and passed the Public Health (Tobacco Control) Regulation in 2013 (PIOJ 2014). The Regulation addressed three (3) main areas namely, smoke free spaces, tobacco advertising, promotion and sponsorship and tobacco packaging and labelling. Additionally, the *Smoking Ban for Indoor Public Spaces Policy* came into effect July 15, 2013.

The increasing prevalence of chronic and lifestyle diseases and environmentally induced illnesses in Jamaica are addressed under *Vision 2030 Jamaica*; strategies for addressing these issues include strengthening Jamaica's institutional responsiveness, early screening of the population to encourage timely interventions, and strengthening of primary health care facilities to increase prevention (PIOJ 2009a, p. 49-50).

Emerging health related threats such as the Chikungunya virus and the Ebola virus pose great danger to human health and safety globally (see Section 6.2 for more information).

4.2.2 THE ECONOMY

Against the background of high public debt, low economic growth, balance of payments pressures and low investor confidence, on May 1, 2013, the GOJ entered into a four (4) year (2013-2017) Extended Fund Facility (EFF) with the International Monetary Fund (IMF) valued at special drawing rights (SDR) 615.38 million (approximately US\$932.3 million). The first disbursement totalled US\$207.2 million. Two successful reviews of Jamaica's macroeconomic performance in April–June and July–September 2013 resulted in two (2) additional disbursements of US\$30.6 million and US\$30.8 million respectively. For 2013 total disbursements stood at approximately US\$268.6 million. In the third review, at the end of December 2013 by the IMF, Jamaica achieved the performance criteria and structural benchmarks that were outlined in the agreement (PIOJ, 2014).

During 2013, real GDP for the Jamaican economy grew by 0.2 per cent compared to 2012 which recorded a decline of 0.5 per cent. This growth resulted from increases of 0.4 per cent and 0.1 per cent in the Goods Producing and Services Industries, respectively. However, for the first half of 2013, real GDP contracted by 0.7 per cent, reflecting a number of issues including unfavourable weather conditions. However, for July – December, the Jamaican economy expanded by 1.1 per cent, reflecting the impact of improved weather conditions; a strengthening in the external demand for some Jamaican goods and services; and an expansion in construction-related activities (PIOJ 2014).

According to the PIOJ (2014) GDP for the Agriculture, Forestry and Fishing Industry declined by 0.5 per cent; real value-added for the Mining and Quarrying Industry increased by 3.8; the Manufacturing Industry contracted by 0.8 per cent relative to 2012, the second consecutive annual decline, and accounted for 8.4 per cent of GDP while the Construction Industry grew by 1.8 per cent in 2013 and accounted for 7.1 per cent of GDP (PIOJ 2014).

Jamaica's rate of inflation for 2013 was 9.5 per cent, 2.5 percentage points higher than the rate recorded for 2012 (PIOJ 2014). Between December 2013 and September 2014 inflation rate was 7.2 per cent¹¹.

The PIOJ (2014) reports that at the end of December 2013, Jamaica's Monetary Base was J\$103.6 billion, \$6.0 billion higher than that recorded at the end of December 2012. Net International Reserves (NIR) was US\$1,047.8 million at the close of 2013, a decline of US\$77.8 million compared to December 2012. Additionally, at the end of 2013 the Gross International Reserves (GIR) stood at US\$1,817.6 million.

The PIOJ (2014) further reports that Jamaica's stock of debt was \$1,938.2 billion at the end of 2013, 9.9 per cent higher than that recorded at the end of 2012. Of this amount the domestic debt stock was \$1,054.2 billion, representing an increase of 5.9 per cent compared to the end of 2012. The external debt stock on the other hand stood at US\$8.3 billion at the end of 2013, 0.7 per cent higher than at the end of 2012.

Additionally, at the end of 2013, Jamaica's exchange rate was J\$106.38 to US\$1.00, representing a nominal depreciation of 12.6 per cent compared to the rate at the end of 2012. However, real depreciation of the Jamaica Dollar was 4.4 per cent compared to 2012 (PIOJ 2014).

Jamaica's debt servicing increased by 8.7 per cent to \$233.4 billion, while non-debt expenditure was \$306 billion or 57 per cent of the budget (Henry 2014).

4.2.3 POVERTY AND UNEMPLOYMENT

In Jamaica poverty is more widespread in the rural areas (poverty rates of 9.9 per cent in the Kingston Metropolitan Area (KMA) and 25.1 per cent in rural areas), where the economy is predominantly of the extractive and production-type industries such as agriculture, forestry, mining, and natural resource-based tourism.

Since 2008, there has been a general increase in poverty in Jamaica exacerbated by the global increase in food and oil prices and also the onset of the global economic crisis since 2009. Rural parishes show a greater prevalence of poverty than urban areas (see Appendix 4). Notably in 2010 poverty in rural parishes climbed to 23.2 per cent up from 22.0 per cent in 2009; whereas in the KMA poverty was at 11.6 per cent compared to

¹¹ <http://www.statinja.gov.jm/default.aspx>

10.2 per cent in 2009 (PIOJ 2012). In Jamaica poverty is not only considered to be cyclical but also inter-generational influenced by a number of issues identified as follows:

1. low educational attainment levels
2. low income earning capability
3. inability to access basic social services
4. lack of economic opportunities leading to underemployment,
5. unemployment and low wage employment
6. poor rural development impacting the opportunities and livelihoods of rural households
7. high levels of risk from exposure to natural hazards and poor environmental practices.

Added to these there are other identifiable features of poverty in Jamaica - the dollar value of eliminating poverty has increased over the past three years because of deteriorating economic conditions and higher prices, which have helped to maintain the poverty cycle:

1. a higher percentage of female-headed households (14.0 per cent) versus male-headed (11.0 per cent) households are poor - a cycle that has persisted over the past decade;
2. households which are poor usually have more adult females and more children;
3. children (0-14 years) registered the highest prevalence of poverty at 21.9 per cent, compared to the working age population (14-64) at 15.6 per cent and 16.8 per cent for the dependent elderly (65+) population;
4. poverty was predominantly highest in the rural areas but is now increasing in urban areas (see Appendix 4); these pockets of urban poverty have been a driving factor of urban risk; and

Interventions to reduce poverty in Jamaica are varied and wide-reaching, ranging from construction of community infrastructure such as roads and schools, water and sanitation projects, rural electrification, and skills building, to cash transfers, residential care and employment programmes. Additional programmes include education and training as well as nutrition support (PIOJ 2012).

In keeping with the standard international definition, unemployment refers to persons who are without work, available for work, either in search of work or not looking for work. According to PIOJ (2014, p. 21.7) in 2013 “unemployment grew by 20,975 persons, an increase of 11.7 per cent compared with the previous year (i.e. 2012)”. Consequently, the annual average unemployment rate increased to 15.2 per cent from 13.9 per cent in 2013 compared to the previous year. (PIOJ 2014).

As at July 2014 the unemployment rate in Jamaica stood at 13.8 per cent or 778,300 persons compared to 767,900 or 15.4 per cent in July 2013, an increase¹².

¹² <http://statinja.gov.jm/LabourForce/NewsLFS.aspx>

Unemployment increased among all age groups except the 55-64 age group over the 2013 period. The total unemployed work force “comprised 76,600 youth and 122 950 adults, representing an increase of 16.6 per cent and 8.9 per cent, respectively (PIOJ 2014, p. 21.7). Unemployment increased by 9100 in the 20-24 age group and by 4975 in the 25-34 age group. For persons of prime working age that is, the 25-54 age group unemployment increased by 10,125. In general adult unemployment rate increased from 8.3 per cent to 11.1 per cent in 2013.

According to (PIOJ 2014) in 2013 youth unemployment stood at 37.7 per cent a 4.3 per cent increase over 2012. Unemployment among females was 48.0 per cent while unemployment among male youths stood at 30 per cent. At July 2014 there were 392,900 unemployed youths in Jamaica. Of this figure 185,700 were males and 207,200 were females (See page 31).

Youths in Jamaica face a number of issues including lower levels of experience, training and certification, coupled with inadequate job opportunities in the global economic climate (PIOJ 2011).

4.2.4 MOST VULNERABLE GROUPS

“Several vulnerable groups have been identified in Jamaica, including children, youth-at-risk, the elderly, persons with disabilities (PWDs), persons impacted by HIV/AIDS, women, and poor families. This list is a demographic characterization, and is not exhaustive” (PIOJ 2009a, p. 78). In Jamaica the most vulnerable populations also include men and women living in rural communities, coastal zones and low-lying flood-prone areas, people with poor housing and the homeless (UNDP 2009). It is estimated that persons at risk make up 60 per cent of Jamaica’s total population and they are generally vulnerable to storm surges, hurricanes and flooding¹³. Much of the vulnerable population also faces exposure to earthquakes and tsunamis by virtue of poor quality housing and location on steep slopes and coastal areas.

Women

Poverty increases the vulnerability of women when there is a disaster because there are often a larger percentage of women amongst the poor population and hence they are often the most at risk (Senior and Dunn 2009). The higher level of poverty and increasing vulnerability to poverty are tied to women’s participation in the labour force typified by lower rates of employment and higher rates of unemployment in comparison to men (Senior and Dunn 2009). In 2013 female unemployment increased to 20 per cent up from 18 per cent in 2012, and women represented 59.8 per cent of the total unemployed labour force in Jamaica (PIOJ 2014). At April 2014, from the total unemployed population of 769,900, a total of 464,800 were females. Additionally, at July 2014 total unemployment increased to 778,300 persons; 310,700 were males while 467,600 were females continuing the trend of higher rates of unemployment for Jamaica females¹⁴.

¹³ (Senior and Dunn 2009; Working Group 1 Vulnerabilities and Capacities 2012)

¹⁴<http://statinja.gov.jm/labourforce/NewLFS.aspx>

In the *Survey of Living Conditions 2010* Jamaica continued to register a large percentage of female-headed households (FHHs), which stood at 47.1 per cent. FHHs with children but no male present represented 55.3 per cent of FHHs (PIOJ 2011). Since 1993, Jamaica has recorded a high percentage of FHHs, increasing from 41.5 per cent to 43.5 per cent in 2002 to 46.7 per cent in 2006 (PIOJ 1998; PIOJ 2007a). FHHs are considered one of the most vulnerable groups in Jamaica (UNDP, 2009). They tend to include more children who in turn are considered vulnerable. As noted in a 2010 study the percentage of FHHs remains high and is largest in the poorest section of the population. The high levels of FHHs affects the ability of women, particularly in poorer households, to access healthcare, which is often sacrificed for other economic priorities including food, shelter and education (PAHO 2010).

Children

In 2013, children (0-14 years) totalled 652,300 or 24 per cent of the total population. A decline in this age-group has been evident over several years (PIOJ 2014). Children (0-14 years) made up 29.4 per cent of Jamaica's total population in 2005, but by 2007 this had declined to 28.3 per cent. A further decline to 23.2 per cent by 2030 is expected (PIOJ 2009a; PIOJ 2014). In Jamaica, underlying vulnerabilities of children are linked to poor families, and FHHs in particular as women tend to earn less than men and are often the poorest in the population. In 2006 the average number of children was 3.6 in female-headed households and three in male-headed households (UNESCO 2011). Children's poverty and their special needs in disasters have been documented (Edwards and Morris 2007; UNICEF 2007).

The Elderly

Jamaica's elderly population (60 years and over) is the fastest growing age group. This group increased to 11.9 per cent of the population in 2013, compared to 11.7 per cent in 2012. The dependent elderly (65 years and over) increased by 8.6 per cent to 233,200 in 2013. Over the period 2007 to 2030, it is estimated that this cohort of Jamaica's population will increase by 2.8 per cent to 11.2 per cent or 321,664 (PIOJ 2009a).

Persons with Disabilities

The disaggregated figures for persons with disabilities (PWDs) are not yet available from the 2011 Census. During 2013, 10,688 PWDs registered with the Jamaica Council for Persons with Disabilities (JCPD). This is recorded against the 2001 Population Census estimation of 6.3 per cent or 163,206 of Jamaica's population having at least one disability. It is generally believed that the level of disability in a population is often understated; the World Health Organisation (WHO) estimates that for most countries the level of disability would be about 10 per cent of total population figures. If this estimation is correct, it may therefore be assumed that in Jamaica PWDs comprise a larger segment of our population than previously estimated. In addition, they have been marginalized from the mainstream of development in the society (PIOJ 2009a).

Jamaica ratified the *United Nations Convention on the Rights of Persons with Disabilities*, and began the implementation of the *National Policy for Persons with Disabilities* in 2000. In May 2014, Government enacted the *Disabilities Act* (2014) which seeks to remove discrimination and provide full access for PWDs to every facet of national life. It is described as “An ACT to promote, protect and ensure the full and equal enjoyment by persons with disabilities, of privileges, interests, benefits and treatment, on equal basis with others and to establish the Jamaica Council for Persons with Disabilities; and for connected matters”.

In the Act “access” includes, in relation to:

- a) premises- freedom to enter in, approach, communicate with, make use of or manoeuvre within, any premises;
- b) benefits-freedom to make use of any benefits;
- c) communication - the capacity to receive and make use of information, and "accessible" shall be construed accordingly.

The Act makes provisions for changes to be made to existing buildings: newly constructed buildings will be required to have these facilities, in order to facilitate PWDs. Breaches of the Act will attract a fine and/or imprisonment. Although the Act is seen as path-breaking and provides protection to PWDs, many argue that the Act does not go far enough and will require strong regulations to be effective. Under this Act, the Council for Persons with Disabilities will be a statutory body with funding from Government.

In June 2013, “the GOJ in partnership with the World Bank secured a grant of US\$3.0m under the Japanese Policy Human Resource Development Grant for a Social and Economic Inclusion of PWDs project. The objective of the project “is to improve human capital and reduce poverty through investment in vulnerable groups, particularly persons with disabilities” (PIOJ, 2014 p. 25.13).

The Homeless

The homeless can be described as persons without a permanent home who live on the streets. Jamaica’s 2001 population census identified 802 homeless persons: 402 lived on the streets with the other 400 living in shelters across the island (Plate 1). However, by 2005 there were 835 homeless adults - 635 were males while 248 were females. . It is also estimated that about 800 children are homeless in Jamaica. Most of Jamaica’s homeless can be found in Kingston and St. Andrew, Montego Bay, May Pen and in coastal towns like Ocho Rios. The number of homeless persons continued to increase as the 2011 population census indicated that there were 934 homeless persons in Jamaica (STATIN 2012). It was also reported that in 2012 there was a further increase to 1,097 persons¹⁵.

¹⁵http://www.jamaicaobserver.com/news/Ja-s-population-grows-3-5-per-cent_12790726



Plate 4.1: A homeless man sleeps on a sidewalk along Knutsford Boulevard on July 3, 2011. Source: The Jamaica Gleaner.

The homeless receive help from Missionaries of the Poor, parish councils, feeding programs and drop-in centers. The National Emergency Operations Centre keeps track of the availability of different shelters and safe havens for the homeless during times of disaster (Workshop 2012, Group 1).

The plight of the homeless is recognised in *Vision 2030 Jamaica*. The Social Welfare and Vulnerable Groups Sector Plan (SWVG) was developed in 2009 to establish:

- a centralized database in order to identify homeless persons;
- finalize and implement a Comprehensive Homeless Strategy;
- provide suitable and safe shelters with adequate sanitary facilities;
- provide adequate nutritional and dietary content of meals provided in approved shelters;
- strengthen Community-based Disaster Management framework (especially regarding evacuation); and
- monitor institutions/facilities to ensure there are disaster plans in place (including evacuation strategies).

Unattached Youth

There is no universally accepted age definition of youth or youth-at-risk. The United Nations defines youth as individuals between the ages of 15 and 24 and in Jamaica, the National Centre for Youth Development adopts the same definition (Blank and Minowa, 2001).

At July 2014 there were 392,900 unemployed youths in Jamaica¹⁶. Of this figure 185,700 were males and 207,200 were females¹⁷. “In 2013 annual unemployment rate was 37.7 per cent - females accounted for 48.0 per cent of this amount” (PIOJ, 2014 p. 25.10).

¹⁶Please note that this figure includes 14-24 age group as grouped by Statin.

¹⁷<http://statinja.gov.jm/labourforce/NewLFS.aspx>

The 1994 National Youth Policy is currently under review and seeks to strengthen existing programmes designed for youth development throughout Jamaica. The Policy includes a focus on unattached youth; youths living and working on the street as well as those in the State-run institutions; young people with disabilities; entrepreneurial and employment opportunities (PIOJ, 2014).

The National Centre for Youth Development (NCYD) and the National Youth Service (NYS) continue to empower the youth with life coping skills by creating an outlet for creative and self-expression (PIOJ, 2014). Additionally, Patterson (2014) reports that Jamaica's Youth Development Programme was allocated a sum of J\$173.6 million to provide assistance to unattached youths as they transition into adulthood. It provides training, on the job work experience, information dissemination, labour intermediation services, and sector management.

There are a number of targets for 2014 including:

- construction of St. Catherine and Hanover Youth Information Centre (YIC) and National Youth Service (NYS) facilities;
- revision of curricula for NYS;
- revision of National Youth Policy, which will facilitate implementation;
- upgrading of the NYS parish offices; and
- procurement of furniture and equipment for Youth Information Centres (YICs) and NYS offices.

Achievements at February 2014 include:

- the completion of several activities such as the design of sewage disposal system for Trelawny Youth Information Centres (YIC)/National Youth Service (NYS) office;
- Career Advancement Programme (CAP) activities;
- design of a Strategic Framework for YICs;
- construction drawings for Hanover NYS/YIC;
- preparatory work for the Post-Graduate Programme in Youth Development;
- data collection for evaluation of the NYS non-residential programme, and CAP;
- the National Youth Policy Green Paper and St. Catherine YIC/NYS offices were partially completed.

The programme is expected to be completed by June 2015, and is funded by the Inter-American Development Bank (IDB), and the Government of Jamaica (Patterson 2014).

There is also the Youth Upliftment Through Employment (YUTE) project established by the Private Sector Organisation of Jamaica (PSOJ) in 2010. Its aim is to facilitate economic empowerment of unattached youths in vulnerable communities across Jamaica. The project focussed on at-risk-youth between the ages of 16 to 29. It provides remedial, vocational, life skills and training opportunities. There is also a work experience, apprenticeship, internship and full-time employment and mentorship and the U-turn intervention feature of the project (Cunningham 2012).

4.3 GOVERNANCE STRUCTURE

4.3.1 POLITICAL STRUCTURE AND ORGANISATION

Jamaica is a unitary constitutional monarchy and a parliamentary democracy with two spheres of government - national and local. H.M. Queen Elizabeth II is Jamaica's head of state. On the advice of the Prime Minister, she appoints a Governor-General who acts as her representative. Neither the Queen nor the Governor-General has any real authority in conducting the administration of Jamaica. The real legislative and executive responsibilities rest solely with the elected representatives of the people – the Members of Parliament (MPs) (JIS 2012; CFLGM 2012).

The legislature, based in the capital Kingston, is bicameral comprising the House of Representatives and the Upper House, the Senate. The House of Representatives is made up of sixty-three (63) members elected by universal adult suffrage by single-member constituencies on the first-past-the-post basis, for terms of no more than five years.

The Senate is made up of twenty-one (21) members nominated/appointed by the Governor-General, thirteen (13) on the advice of the Prime Minister, and eight (8) on the advice of the Leader of the Opposition. Traditionally both parties will nominate some independent members. The Senate usually functions as a review chamber, considering Bills passed by the House of Representatives. However, the Senate may also initiate legislation.

The Prime Minister is the Head of Government and he/she presides over and appoints a Cabinet from the House of Representatives and the Senate. He/she advises:

1. the Queen on the appointment of the Governor-General
2. the Governor-General on the appointment of the six (6) members of the Privy Council, on the dissolution of Parliament and on appointments of the Chief Justice, the President of the Court of Appeal and the three (3) Service Commissions as enshrined in the Constitution.

However, for appointments of the senior members of the Judiciary and the Service Commissions, the Prime Minister consults with the Leader of the Opposition before an appointment is made.

The Cabinet is the centre of Jamaica's system of Government and is responsible for the general direction and control of Government business. It is here Government policies and programmes are initiated. The Cabinet must consist of the Prime Minister and not less than eleven other ministers. Of this eleven not more than four (with portfolio responsibilities) must be appointed from the Senate. The other seven Ministers are appointed from the House of Representatives. Important matters, for instance, those which may be discussed in Parliament, are brought before the Cabinet for discussion and decisions (JIS 2012; CFLGM 2012).

Effective governance is an essential foundation of any society as it provides the stability needed for growth and development. Jamaica has been plagued with challenges to governance. On the surface, the country has strong formal institutions with a well-established parliamentary democracy, a vibrant civil society and media and also a strong and competent civil service. Nonetheless, Jamaica continues to show signs of social and political polarisation, which makes it increasingly difficult to form consensus on policies. Factors that have contributed to the weakening of governance in Jamaica include:

1. Apathy towards, and alienation from, existing political institutions and processes and an increasing disregard for the norms of civil society by a large number of persons, especially the young
2. Consistent poor performance of the economy and the persistence of poverty
3. Increased criminal activity (e.g. drug trafficking and large number of gangs)
4. The State's inability to sustain levels of social welfare that were put in place in the post-independence era
5. An inadequate local governance framework

Jamaica's Government has a redefined position; arguably, - it has moved from one which operated like a development agency to that of facilitator of market driven policies (PIOJ 2012).

4.3.2. LOCAL GOVERNMENT AND LEVELS OF DECENTRALIZATION

Traditionally Jamaica has had a single tier system of local government, made up of local authorities called Parish Councils. These have, been reduced over time from twenty-two (22) to fourteen (14), and then to thirteen (13) with the amalgamation of the Parishes of Kingston and St Andrew to form the Kingston and St. Andrew Corporation (KSAC). The 2003 *Municipalities Act* was an innovation which led to the creation of the Municipality of Portmore, which has responsibility for many functions related to this rapidly growing urban centre. The Municipality however, remains under the jurisdiction of the St Catherine Parish Council. This innovation is major feature of Local Government Reform (which started in 1994) in Jamaica and seeks to create a strong, viable and vibrant system of local government in Jamaica (JIS 2012; CFLGM 2012).

The Minister of Local Government heads the Ministry which provides oversight for the laws governing the organisation, structure, powers, administration and financing of local authorities in Jamaica. The Ministry also provides technical advice, guidance, and coordinates activities between all local and central government programmes in order to achieve the objectives and common standards. It has four agencies which assist in discharging its responsibilities. These are the Jamaica Fire Brigade (fire prevention and control); the National Solid Waste Management Authority (solid waste collection and disposal); the Board of Supervision (poor relief/welfare services); and the Vineyard Town Golden Age Home (CFLGM 2012).

There are currently two hundred and twenty-seven (227) Councillors serving the thirteen Parish Councils; each headed by a Mayor who acts as the Chairperson of the Council.

Elections are conducted by universal adult suffrage on a first-past-the-post system for a three year term. The Mayor is elected by the council. The electoral divisions within the parish are each represented by one member. Parish Councils undertake their responsibilities through a committee system. By law they have two main committees: Finance and Poor Relief. Parish Councils have discretionary powers to establish other committees which are usually public health, commercial services, building and town planning, and roads and works. Standing committees have delegated decision-making powers while other committees have powers to recommend. There are also Ad-hoc committees which are formed to address specific issues. Further, some authorities establish Executive Committees to assist the leadership of the Council (CFLGM 2012).

Additionally, non-statutory bodies called Parish Development Committees (PDCs) have been established in all parishes to facilitate meaningful participation of all stakeholders in the processes of local governance, local sustainable development, and to facilitate partnership, collaboration and cooperation among all parish groups in seeking to achieve the tenets of good governance. PDCs play an important role, in collaboration with the local authorities, in preparing and implementing local sustainable plans for their parish (CFLGM 2012; JIS 2012).

Parishes have also established Parish Disaster Committees which take responsibility for Parish DRM programmes, and have employed full-time Parish Disaster Coordinators.

4.3.3. COORDINATION MECHANISMS BETWEEN STATE AND NON-GOVERNMENTAL ACTORS

As the World Bank (2010) notes, Jamaica has been successful in integrating its approach to DRM. There has been an integration of the public, private, technical, scientific and voluntary sectors as well as local government agencies and communities.

These groups are represented on the National Disaster Committee and its sub-committees and their roles are included in the *National Disaster Plan (1997)*. *Vision 2030 Jamaica* not only acknowledges the importance of partnerships between Government (central and local), citizens and the private sector (internal and external) and other partners, but sees them as necessary to ensure that the strategies identified under *Vision 2030 Jamaica* are implemented using resources garnered from partners.

4.4 THE DEVELOPMENT CONTEXT

Over the last 40 years, Jamaica has had prolonged periods of low economic growth, large fiscal deficits, and weak export performance. Between 1973 and 2007 the country's real GDP grew by only 0.8 per cent per annum but in the last ten years GDP grew by 1.3 per cent. However, Jamaica is heavily indebted and in 2013 the debt-to-GDP ratio stood at 138.9 per cent. Between 1999 and 2013 the debt to GDP ratio averaged 120.2 per cent (Thompson 2014). Thompson (2014) also indicated that the fiscal policy paper 2014 -

2015, Jamaica's public debt was projected to increase to US\$2.09 trillion in the fiscal year 2014-2015 an increase of 7.4 per cent or US\$144.4 billion.

Development in Jamaica has been generally characterised by periods of poor economic performance interspersed with short periods of economic growth. It included structural adjustment measures (liberalization and privatization) in some key sectors including tourism. Development in Jamaica is also hampered by the negative impacts of disasters including hurricanes (2004-Ivan, 2005-Wilma, 2007-Dean and 2012-Sandy), the terrorist attacks on the USA in 2001, rise in oil prices since 2004 and the global recession. Currently the sugar and banana industries are in decline partly as a result of the ending of trade preferences with Europe, which had formerly guaranteed markets for these products. Jamaica currently has a growing public debt; increasing poverty and environmental deterioration.

There is currently a global economic crisis evidenced by the current global recession, rising levels of unemployment, failure of a number of institutions including banks, rise in prices including basic food items and oil. The global recession continues to have a significant impact on the Jamaican economy and the GOJs development strategy. Total remittances increased to US\$2,065.0 million compared with US\$2,042.5 million in 2012 (PIOJ 2014 p. 6.8). Adding to the rising inflation, the Jamaican dollar devalued against the US\$ by 22 per cent from September 2008 to mid-February 2009. Further devaluation of the dollar at the end of 2013 resulted in an exchange rate of J\$106.38 to one US\$1.00. This represented a nominal depreciation of 12.6 per cent compared to the rate at the end of 2012. However, real depreciation of the Jamaica Dollar was 4.4 per cent compared to 2012 (PIOJ, 2014).

The challenges in Jamaica are many and varied. In 2014 Jamaica's GDP per capita stood at US\$5,140. While real GDP growth (percentage change) for 2014 is 1.1 per cent and is projected to increase to 1.8 per cent in 2015. The IMF World Economic Outlook, indicated that Jamaica's GDP stands at US\$13.9 billion¹⁸. Jamaica in 2013 is ranked 96th out of a total of 187 countries by the HDI and ranked 55th out of 178 countries in the Environmental Performance Index (EPI) with a score of 58.26¹⁹. The Global Competitive Index (GCI) ranks Jamaica 86th out of a total of 144 countries with a score of 3.8²⁰.

Other challenges include migration, debt, decrease in access to capital, low productivity in most sectors, fiscal imbalance, poor export performance, weak infrastructure, weak educational performance, increasing unemployment (especially for persons 15-24 years), insufficient transparency and accountability in government and high perception of corruption in the society (PIOJ 2009).

It is against this backdrop of challenges that *Vision 2030 Jamaica* was conceptualised to lead Jamaica on a transformational path to sustainable prosperity as it seeks developed

¹⁸www.imf.org/external/pubs/ft/weo/2014/02/weodata/index.aspx

¹⁹<http://epi.yale.edu/epi/country-profile/jamaica>

²⁰http://www3.weforum.org/docs/GCR2014-15/GCR_Rankings_2014-2015.pdf

country status by 2030. This is enshrined in the new vision of “Jamaica the place of choice to live, work, raise families and do business” enunciated in *Vision 2030 Jamaica*.

4.4.1 NATIONAL DEVELOPMENT OBJECTIVES

‘Vision 2030 Jamaica - National Development Plan’ (PIOJ 2009a) - provides “a comprehensive framework in which the linkages among economic, social, environmental and governance sectors are made, and presents a broad strategic thrust for the transformation of the Jamaican economy and society towards sustainable development and prosperity for the Jamaican people” (PIOJ 2009, p. 24).

It envisages a Jamaica where there is equal access to education, health care, nutrition, basic amenities, environmental goods and services, and where civility and social order dominate. *Vision 2030 Jamaica* acknowledges the importance of transformation and seeks to transform mind sets, improve attitudes and influence behaviour as it embraces a new paradigm shift toward a sustainable society via development that “meets the need of the present without compromising the ability of future generations to meet their own needs” (WCED 1987).

Generally, a developed country bears certain characteristics including high levels of per capita income, advanced productive sectors, well developed infrastructure and social services, involvement in research and innovation. Additionally, human development in countries is often measured using the HDI which combines life expectancy, literacy, school enrolment and per capita GDP. A score of 0.80 or higher is equated to high level of human development (PIOJ 2009a). As stated earlier, in 2013 Jamaica had a score of 0.715 and was ranked 96; Jamaica remains in the high human development category. The index categorises 187 countries in four categories - very high human development, high human development, medium human development and low human development (Human Development Report 2014).

Vision 2030 Jamaica - National Development Plan

The Government of Jamaica, in collaboration with the private sector and civil society, prepared a long term national development plan: *Vision 2030 Jamaica- National Development Plan* which envisages Jamaica achieving developed country status by 2030. The Plan introduces a new development paradigm by redefining Jamaica’s strategic direction. Integration of DRM into project development is also an area of focus as it relates to national development.

The old paradigm of development focussed on generating prosperity through the exploitation of Jamaica’s natural environment, as it promoted - sun, sea and sand tourism and exporting sub-soil assets like bauxite and basic agricultural commodities (Figure 4.2). These were considered inadequate if sustained economic and social development was to be realized in Jamaica.

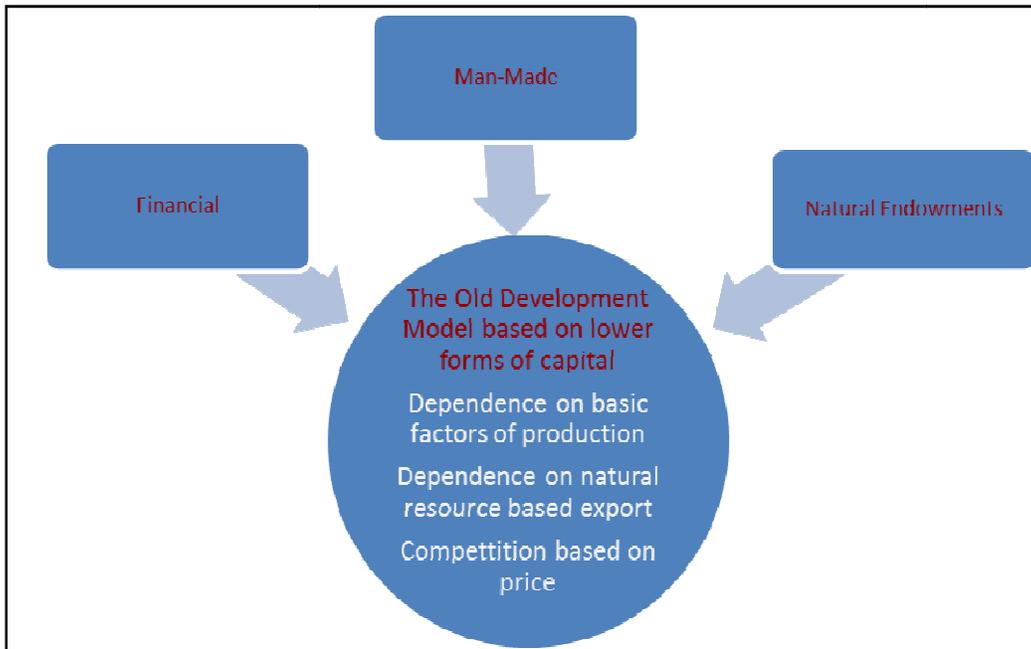


Figure 4.2: Jamaica's Old Development Model based on the capital stocks of the nation. Source: PIOJ 2009a.

In this regard a new development paradigm was created for Jamaica. This new paradigm is focussed on developing the country's higher forms of capital – that is, the cultural, human, knowledge and institutional capital stocks coupled with a reduction in inequality across Jamaica (Figure 4.3). These strategies it is felt, will move Jamaica to the desired higher stages of development, as there has to be a *“shifting from the employment of lower forms of capital to activities driven by higher forms of capital which would boost productivity and establish the basis for a higher standard of living”* (PIOJ 2009a, p. 25).

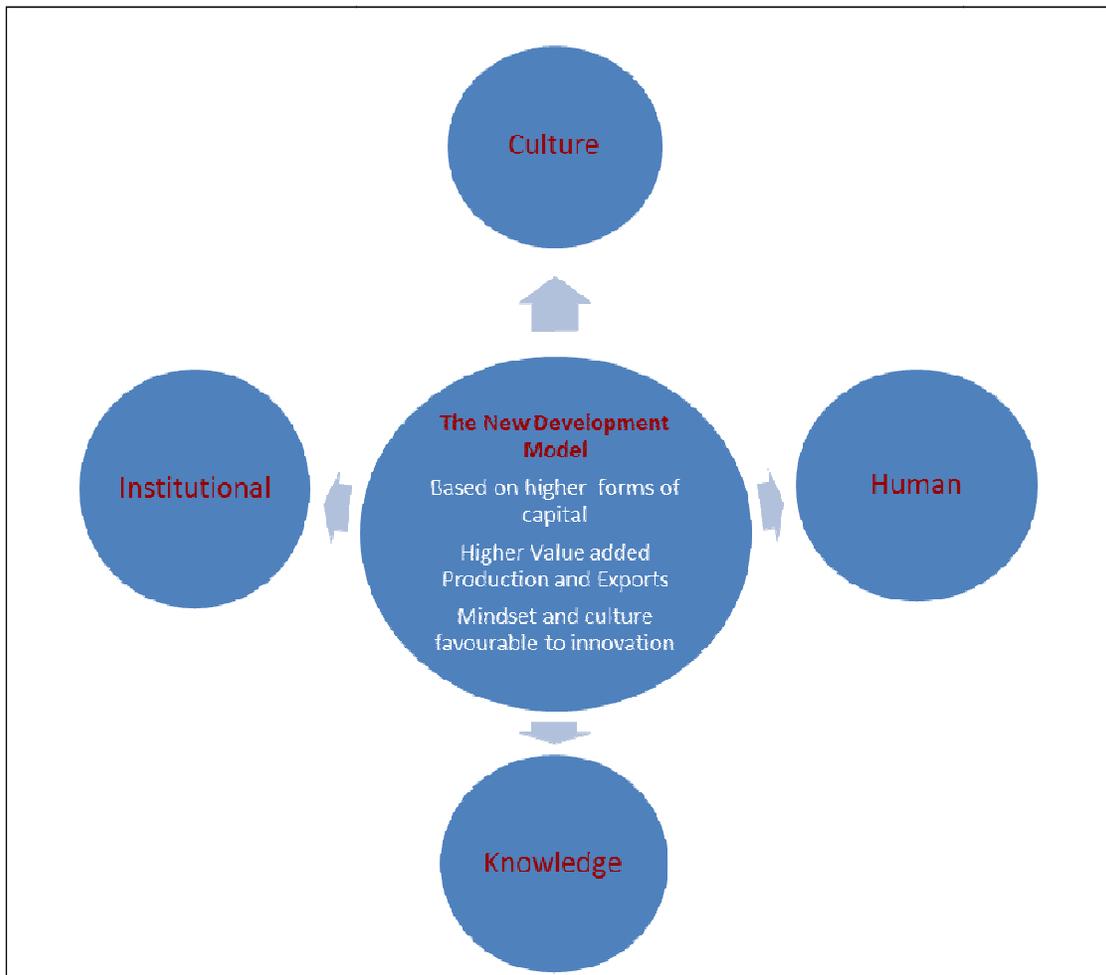


Figure 4.3: Jamaica’s New Development Model based on the higher capital stocks of the nation. Source: PIOJ 2009a.

This new paradigm is shaped by the following seven principles:

1. **Transformational leadership:** Strong leaders needed in both government and civil society to chart the course of transformation to developed country status.
2. **Partnership:** Partnerships between Government (central and local), citizens and the private sector (internal and external) are necessary to ensure that the strategies identified under *Vision 2030 Jamaica* can be implemented using resources garnered from partners. These would include financial and technological support, which Jamaica needs.
3. **Transparency and accountability:** important for effective operation of the economy and enhancing social well-being. This will also improve accountability and measure performance.

4. **Social cohesion:** influence a sense of nationhood and a sense of belonging in the Jamaican people as they pursue a common goal.
5. **Equity:** equal opportunities and equal rights for all Jamaicans including access to education and proper health care. Human rights, the plight of the poor and the vulnerable as well as issues of gender will be addressed.
6. **Sustainability:** an integrated approach to economic, social and environmental issues coupled with good governance will promote sustainable development.
7. **Urban and rural development:** development of both rural and urban areas will be actively promoted via decentralization of power and decision making and proper use of resources.

Jamaica's approach to development has changed. The approach is now "*broad in scope, participatory in design and implementation, long-term in reach and transformational in character*" (PIOJ 2009, p. 37). This new approach is built around 4 broad comprehensive and interconnected goals (Figure 4.4):

1. Jamaicans are empowered to achieve their fullest potential
2. The Jamaican society is secure, cohesive and just
3. Jamaica's economy is prosperous
4. Jamaica has a healthy natural environment

These goals form the pillars of the new development paradigm and will be achieved by a process of developing, preserving and proper use of the nation's capital stocks in activities driven by what are considered the higher forms of capital namely, cultural, human, knowledge, institutional assets in order to improve Jamaica's overall productivity and lay the foundation for sustainable standards of living for Jamaicans. At the base of this new thrust is the task of changing the mindset of a nation. PIOJ (2009a, p. 15) states "*the Jamaican economy must be recast through the adoption and infusion of the transformative values to change the attitude of workers and employers, to improve their abilities to work together and increase productivity. These values are found to be strongly correlated with higher levels of productivity and higher levels of income.*"

As it relates to Goal 4, disaster risk reduction is addressed explicitly under National Outcome 14 but is also addressed under National Outcomes 13 and 15 respectively. Under National Outcome 14 of Vision 2030, Jamaica will seek to reduce the cost of damage caused by disasters to less than 1 per cent of GDP. Since hazard risk reduction is not adequately integrated into socio-economic decision-making there would now be greater emphasis on hazard risk management activities and programmes for reducing existing and future vulnerability in Jamaica (PIOJ 2009a).

National Outcomes linked to National Goals

Goal 1- National Outcomes

1. A healthy stable population
2. World-class education and training
3. Effective Social Protection
4. Authentic and Transformational Culture

Goal 2- National Outcomes

5. Security and safety
6. Effective Governance

Goal 3- National Outcomes

7. A stable macro economy
8. An enabling business environment
9. Strong economic infrastructure
10. Energy security and efficiency
11. A technology-enabled society
12. Internationally competitive industry structures
 - Agriculture
 - Manufacturing
 - Mining and Quarrying
 - Construction
 - Creative Industries
 - Sport
 - Information and communications technology (ICT)
 - Services
 - Tourism

Goal 4-National Outcomes

13. Sustainable management and use of environmental and natural resources
14. Hazard risk reduction and Adaptation to Climate Change
15. Sustainable Urban and Rural Development

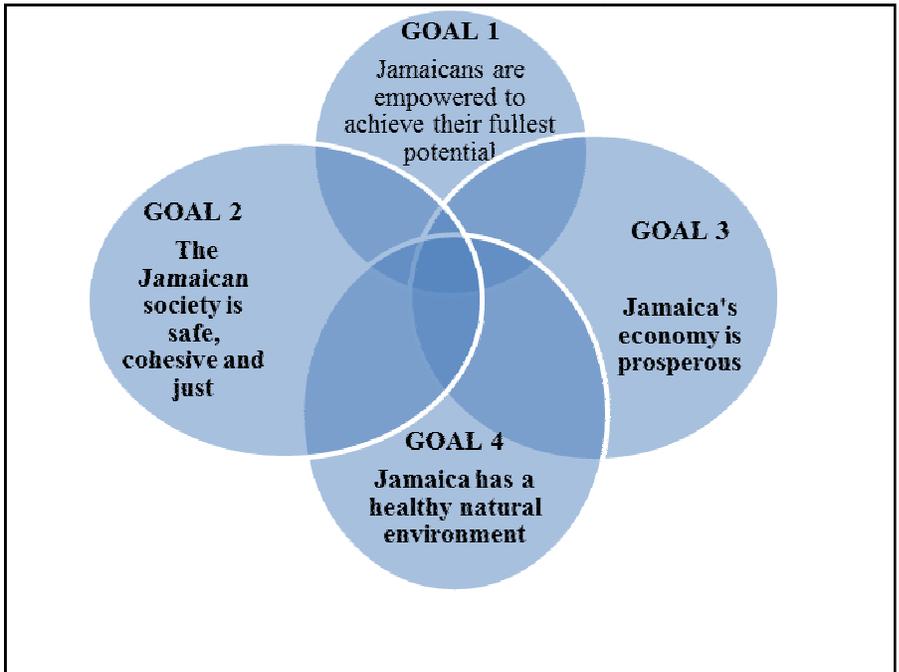


Figure 4.4: Jamaica’s National Goals. Source: PIOJ 2009a.

This will be achieved via four proposed national strategies namely:

- i. Improving resilience to all forms of hazards;
 - ii. Improving emergency response capability;
 - iii. Developing measures to adapt to climate change;
- and
- iv. Contributing to the effort to reduce the global rate of climate change.

(See Section 6.41 for more information on the goals.)

4.5 SUMMARY

Jamaica’s location increases its vulnerability to multiple hazards including earthquakes, landslides, tropical cyclones, floods, droughts and tsunamis. The majority of the towns in Jamaica are located along the coastline which increases their vulnerability to storm surge and sea level rise. Formal and informal settlements along river channels are likely to be flooded when rivers overflow their banks, making residents of these areas vulnerable.

The morphology of the island provides an enabling environment for these events as streams with narrow channels and floodplains are a common feature in the middle and courses. The recent flooding of Portland and St. Mary due to intense rainfall highlighted the vulnerability of communities to flooding. This resulted in ponded water thereby restricting access to affected areas. These related impacts usually hinder development and investment due to the level of risk involved. It is also important to note that these impacts hinder progress towards the achievement of the MDG's.

The rainfall pattern in Jamaica is marked by bi-modal peaks in May and October which are defined as the two rainy seasons. Dry conditions usually occur over the period of November to April and results in problems related to water availability and access. An increasing population, location of some communities and distribution challenges hinder equitable distribution of water across the island especially during droughts. Annual rainfall totals might be influenced by tropical cyclones passing over or near the island in a given year. These systems replenish the aquifers and major catchments on which the population depends heavily. It is important to consider the potential impacts of climate change as temperatures and rainfall patterns will be affected. This may result in variable rainfall which can increase the pressure on the existing water system of the country thereby limiting access to water among a greater percentage of the population. Competition for water from other sectors such as agriculture and tourism should also be considered.

Jamaica is currently facing a number of challenges as it relates to its population namely- an increase in its ageing population, a decrease in its younger population and the issue of migration which has negatively impacted the population growth, structure and characteristics. As a result PIOJ (2009a) states that, as it begins to grapple with its ageing population, Jamaica's "*changing population profile points to the need for greater concentration on programmes for the elderly, and eventually a levelling in the requirements for infrastructure for children and youth*" (PIOJ 2009a, p. 40). Jamaica's working age and elderly population will constitute a higher proportion of the population as a result of declines in fertility and mortality rates and emigration of its younger population.

Recognising the vulnerability of PWDs, in May 2014 the Government of Jamaica enacted the *Disabilities Act* aimed at removing discrimination and providing full access to services PWDs. The Act seeks to promote, protect and ensure the full and equal enjoyment by persons with disabilities, of privileges, interests, benefits and treatment, on equal basis with other citizens. It also makes provisions for changes to be made to existing buildings; and newly constructed buildings are required to have these facilities, in order to facilitate PWDs.

Unattached Youths in Jamaica are being trained, mentored and empowered to reduce their vulnerability via a various projects and institutions including the NYCD and the NYS. Training will continue as Jamaica seeks to reduce its unattached youth population

and provide skills training and employment, on the job experience and mentorship to this category of its population.

Disasters affect the quality of life of every Jamaican and sectors as diverse as public health and economic growth. In addition, the destruction or degradation of Jamaica's natural assets may reduce the opportunities and choices available for future generations. The Government has established DRM/sustainable development as a national priority, and recognises that many aspects of DRM/sustainable development are more appropriately managed through decentralization where the private sector, NGOs, or community groups do their part under the coordination of central and local government. Furthermore the GOJ has committed through *Vision 2030 Jamaica* to tackling the issue of vulnerability to hazards through a number of national strategies and programmes.

Vision 2030 Jamaica objectives, medium term and long term goals can only be accomplished through partnerships at every level of the Jamaican society. The global economy has far reaching effects all around the globe, Jamaica is not immune. As a result negative impacts will continue to be experienced such as limited access to capital markets, and unemployment, disruption in social development plans and difficulty in meeting MDG targets are only some of the issues Jamaica will have to grapple with (PIOJ 2009a). Additionally, Jamaica's declining GDP, increasing debt, poverty, weak economic performance, issues of justice, brain drain, limited resources, lack of transparency, declining environmental health, increased vulnerability to disasters and climate change are some other issues to consider. However, it is within this context that the Government has developed this policy document and has set out a clear path to achieving the goals of getting Jamaica to developed world status by 2030.

Achieving the national outcomes will be no easy task; political will and action will be key ingredients to Jamaica's success.

5. THE COUNTRY'S DISASTER RISK REDUCTION LEGAL AND INSTITUTIONAL FRAMEWORK

5.1 LEGAL FRAMEWORK

Jamaica has several laws and other legal provisions that delineate the reach, structure, functions, roles and responsibilities for organisation/agencies involved in DRR. These laws and legal provisions provide operational and administrative guidelines for reducing disaster related risk. In addition, they are used by the lead agency, its members, and inter-sectoral committees. Jamaica's main legal authorities relating to disaster risk reduction and emergency management are constitutional and statutory. The *Constitution of Jamaica* is the main constitutional reference while the *Disaster Preparedness and Emergency Management Act* (1993) and the *Emergency Powers Act* (1938) are the main statutes of reference (CELP 2010). The newly approved *Disaster Risk Management Bill* (2014) will repeal the *DPEM Act* of 1993.

5.1.1 CONSTITUTION

The *Constitution of Jamaica*, developed in 1962, highlights the constitutional authority outlined in Chapter III and speaks to the enforcement of protective provisions and outlines the role of the appointed officials. Chapter III, Section 26 identifies particular events such as major hurricanes and earthquakes as events that can warrant a state of emergency being declared. The limited (30 days) state of emergency can be declared by the Governor General based on the decision of the Cabinet. This initial thirty (30) days can be extended for up to twelve (12) months by a resolution and majority vote of all the members of the House of Representatives (CELP 2010). Similarly, the state of emergency can be revoked with a resolution and majority vote of all the members of the House of Representatives.

5.1.2 LAWS and LEGALLY BINDING PROVISIONS

As it relates to statutory authority in Jamaica, the *Emergency Powers Act* (1938) reflects Chapter III of the Constitution and allows the Governor General to make regulations during a public emergency. This ensures that life and property, both nationally and locally, as well as essential supplies are protected. Under the *Emergency Powers Act* (1938), the Governor General, if necessary can give any Government Department such powers as necessary during an emergency or disaster event.

The *Disaster Preparedness and Emergency Management (DPEM) Act* (1993) outline guidelines for the development and operation of Office of Disaster Preparedness and Management (ODPEM) along with its response mechanisms. It gives limited power to the Prime Minister in making disaster declarations including declaring certain areas - *disaster zones*. The limited power can be exercised by the Prime Minister during disaster events or an impending threat based on the advice of ODPEM. This is important as prior to development of the DPEM Act, the *Emergency Powers Act* was used during disasters.

The DPEM Act allows the government to declare disaster areas without having to resort to the *Emergency Powers Act*. The newly approved *Disaster Risk Management Bill* (2014) will provide guidelines for the declaration of disaster areas, and evacuation orders. It will also give power to ODPEM to create regulations in disaster management and gives legal standing to authorities and documents pertaining to disaster management. The Act was passed in the House of Representatives in October 2014 and approved by Senate in November 2014.

A project addressing improvement in the legal framework for international disaster assistance was implemented through the Jamaica Red Cross in 2013. Some preliminary findings from this study are (i) that the national disaster plan is not enshrined in law and is therefore open to administrative changes (ii) there is need for harmonisation among the national plan and external plans such as the UN Cluster-based plan as well as among sectoral plans, (iii) operational experiences are not captured in the plans as these plans are not regularly updated.

The *Kingston and Saint Andrew Corporation Act* (1931) outlines “provisions of the KSAC, defines its functions and powers, provides for election in the Corporate Area (as defined in Schedule 1), provides for the organisation and administration of the Corporation and its property and provides for various other matters related to the Corporation and its operations²¹.” The Act also incorporates regulations on health and environmental issues in which the Corporation can impose penalties/sanctions for particular offences that may or may not influence disaster related risks.

The *Defence Act* (1962) governs the actions, procedures and operations of the Jamaica Defence Force (JDF). The Act outlines the development of the regular and reserve forces along with their names. It also outlines the duties of the Defence Board as defined by the Act and charges the JDF with the defence and maintenance of order in Jamaica²². The JDF is deployed once a public state of emergency is declared by the Governor General to ensure that public order is maintained.

The *Fire Brigade Act* (1988) and the *Country Fire Act* (1942) provide frameworks geared toward reducing risk related to fire hazards. The *Fire Brigade Act* (1988) governs the establishment and operation of the Jamaica Fire Brigade which aims to minimize loss of lives, injury to persons and damage to property from fires, natural disasters, accidents and other emergencies as necessary²³. The *Country Fire Act* (1942) empowers the Minister to prohibit open fires especially at night. The Act outlines punishment of offences and highlights the negligent use of fire.

²¹ http://faolex.fao.org/cgi-bin/faolex.exe?rec_id=071880&database=faolex&search_type=link&table=result&lang=eng&format_name=@ERALL

²² <http://jdfmil.org/FAQs/faqs8.php>

²³ <http://www.jamaicafirebrigade.org/missn.html>

The Ministry of Local Government and Community Development is governed by legislation such as the *Parish Councils Act* (1887), (which governs the actions, procedure and operations on the Parish Councils), the *Parochial Rates and Finance Act* 1900 (governs revenue generation), the *Kingston City Corporations Act* 1923 (provides provision for the KSAC), the *Poor Relief Act* 1867 (governs the distribution of poor relief) and the *Municipalities Act* 2003 (facilitated the creation of the Portmore Municipal Council)²⁴. The *Building Act* 2011 was created to ensure safety in the building environment by the Parish Council. Local government is responsible for the development and maintenance of parochial infrastructure and poor relief while the provision of essential services such as water supply, environmental health, sanitation and development control is shared with central government. Local government is assisted by the Jamaica Fire Brigade (fire prevention and control); the National Solid Waste Management Authority (solid waste collection and disposal) and the Board of Supervision (poor relief/welfare services, and the Vineyard Town Golden Age Home). These agencies are assigned different roles and responsibilities aimed at reducing associated risk.

The *Water Resources Act* (1995) outlines the responsibility for planning, development and equitable allocation of water resources of the Water Resources Authority (WRA). The Act gives power to the Minister to guarantee loans to the WRA and prohibit the use of water for particular activities where necessary. Provisions for the abstraction and use of water, control of water quality, control and protection of underground water are all outlined (WRA 1995). The Act allows for punishment of persons who dispose of sewage (especially in limestone areas) and industries with hazardous effluent discharges that would significantly affect water quality. The Act also has provisions dealing with health issues such as dysentery and cholera that are caused from sewage contamination.

The *Town and Country Planning Act* (1958) provides guidelines for land use based on legal instruments known as Development Orders which cover most of the urban and coastal areas of Jamaica. “Development Orders are to control both rural and urban development, ensure proper sanitary conveniences, coordinate building of roads and other public services, and protect public amenities (conservation areas, wetlands, mangroves)”²⁵. The Act outlines specific standards for land use, density and zoning in reducing disaster related risks.

The *National Solid Waste Management Act* (2002) governs the actions, procedures and operations of the National Solid Waste Management Authority (NSWMA) as it relates to the collection and disposal of waste in safe guarding public health. The Act also highlights operational guidelines for hazardous waste as a transboundary hazard. Sanctions are incorporated into the Act and enforcement is the responsibility of various organisations/agencies.

²⁴ http://www.clgf.org.uk/userfiles/1/files/Jamaica_per_cent20local_per_cent20government_per_cent20profile_per_cent202011-12.pdf

²⁵ http://www.nepa.gov.jm/eias/Kingston_Container_Terminal/chapter9.htm

The *Public Health Act* (1974) outlines the provisions and guidelines for the establishment of the Central Health Committee and Local Boards to contain and treat various diseases. The immunization of children is a major feature of the Act based on their vulnerability to particular diseases. The Act also requires updating of the immunization certificate of children. The Act empowers the Minister to prohibit the assembly of persons and/or to order the closure of public places or schools if necessary (PHA 1985). In 1985, the Act was amended to include monitoring of imported food, food preparation and distribution. The Hazard Analysis Critical Control Point (HACCP) system is a procedure utilised by the Ministry of Health to ensure safe food production. Penalties can be applied where provisions and guidelines are not adhered to.

The *National Resources Conservation Authority (NRCA) Act* (1991) was established to protect and manage Jamaica's natural resources and control pollution. The guidelines provided by this Act cover monitoring and enforcement of environmental laws and regulations with regards to watershed protection and beach control among other issues. "The Environmental Control Division (ECD) of the Ministry of Health and local planning authorities monitor construction work to ensure that all development restrictions and requirements are properly adhered to"²⁶. Sanctions and penalties can be assigned to particular offences based on breaches of the Act.

The *Parish Building Regulation and Development Orders* outline and guide the development process in Jamaica. The *Parish Building Regulations* provide guidelines to developers based on the existing building codes. The *Parish Development Orders* ensure that premises in areas of the parish are not used contrary to the purpose provided by developers and residents. Other regulatory and related instruments pertaining to DRR include but are not limited to the *Severe Weather Orders*, the *National Building Code* (draft), and international legislative considerations and guidelines such as the Ramsar Convention and the Convention for Biodiversity.

The *Building Code* (draft) has been updated and awaits approval from Cabinet. Although the Code has not been passed into law, local authorities are able to enforce building regulations under the *Building Act*. However, as many buildings are constructed without official approval, there are a number of structures which have not benefitted from technical inputs and which do not adhere to the Building Code or building regulations. This lapse in enforcement is due to inadequate numbers of trained building inspectors at Parish Councils. In addition, only some Parish Councils have employed structural engineers.

5.2 POLICY FRAMEWORK

Several policies and action plans have been established and utilised within the DRR framework in Jamaica. Based on the impacts of recent hazards, Jamaica has given more

²⁶ http://www.nepa.gov.jm/eias/Kingston_Container_Terminal/chapter9.htm

focus to DRR by revising and updating relevant disaster management policies, frameworks and plans.

National Policies

The *National Hazard Mitigation Policy* (1999) (draft) provided the focus needed on hazard-risk reduction and preceded the draft *National Hazard-Risk Reduction Policy (NHRP)* which was developed in 2005 to address the issue of hazard-risk reduction and its relevance to development. The NHRP provides “a framework for integrating hazard mitigation into all policies, programmes and plans at the national and community levels” (NHRP 2005, p. 4). In the context of the regional CDM Strategy, Jamaica has begun the process of developing its *Comprehensive Disaster Risk Management Policy (CDRMP)* to guide DRR activities and emergency management (ODPEM 2013). This new comprehensive policy is also necessary for alignment with the country's newly approved DRM legislation which will reflect several changes in the DRM landscape within the country (ODPEM 2013).

The *National Disaster Relief Policy (NDRP)* was developed after Hurricane Gilbert in 1988 and highlighted the need for relief support to victims; the *Emergency Shelter/Welfare Action Plan for Jamaica*, the *Relief Clearance Plan*, the *Overseas Assistance Plan* and the *Logistics Plan* were therefore written in support of the policy. The action plan within the NDRP provided operational procedures and guidelines to the government and other sectors in responding to victims of disasters. The concept of relief and welfare management was tested after the earthquake in 1993 in which supplies were distributed at the parish level. Further development in 1995 by the National Welfare/Shelter Sub Committee saw the creation of the document which included assistance for victims of minor floods, earthquakes and landslides (NDRP 1995). The NDRP defines the roles of welfare agencies including NGO partners, during the recovery stages of a disaster, type and range of assistance given to the impacted, and guidelines for access to short and long term assistance.

National Disaster Funds

The National Disaster Fund (NDF) offers recovery support after the occurrence of major hazard events. The NDF is managed by the Finance and Administration Sub-committee of the National Disaster Committee which is responsible for the growth and disbursement of the fund through ODPEM (CELP 2010). Funds are usually disbursed for relief and early recovery efforts. Since its inception, the Fund has been inadequately financed by government allocation based on fiscal constraints and other competing priorities. However, the newly approved *Disaster Risk Management Bill* (2014) will require that contributions be made to the NDF annually from local authorities.

Climate Change Policies/Frameworks

The *Regional Framework for Achieving Resilience to Climate Change in the Caribbean* was developed in 2009 by CCCCC and provides technical assistance to member states

such as Jamaica. Several strategies and programmes are outlined within the framework and provide strategic direction for action over the period 2009-2015 by establishing directions to build resilience to climate change among CARICOM states including multi-sector roles (CCCCC 2009). Also, Jamaica is in the process of developing a national framework and communication strategy on climate change to increase awareness and reduce the impacts related to climate change.

The *National Climate Change Policy and Action Plan* (2014) (draft) was developed by the Ministry of Water, Land, Environment and Climate Change (MWLECC) and includes actions relating to DRR. The policy aims to “*enhance the resilience and adaptive capacity of Jamaica to cope with climate change impacts and mitigate the causes of climate change in a coordinated, effective and sustainable manner*” (MWLECC 2014, p. 6). The draft Policy highlights future threats from climate related hazards and potential impacts in Jamaica on vulnerable sectors such as agriculture, health, energy and tourism as well as key resources such as water. It is important to note that the Policy is aligned with Goal 4 of *Vision 2030 Jamaica - National Development Plan: ‘Jamaica has a Healthy Natural Environment’* in order to achieve developed country status by 2030 (MWLECC 2014). The Policy is currently being revised and will be submitted for White Paper approval shortly.

5.3 INSTITUTIONAL FRAMEWORK

5.3.1 ORGANISATION OF THE NATIONAL SYSTEM

The national disaster framework for Jamaica is based on a four tiered system – national, regional, parish and community levels and is guided by the *National Disaster Plan* (1997). The general structure is that of a committee divided into sub committees which function as working groups. This structure is adjusted to the level at which it is being implemented.

National Level

The Prime Minister, as the head of government, has ultimate responsibility for DRM in Jamaica; s/he is the Chair of the National Disaster Committee (NDC) which is the body responsible for approving policy and strategic plans for DRM (Figure 5.1). The NDC will be renamed the National Disaster Risk Management Council (NDRMC) under the newly approved DRM Bill (2014) which will provide additional disaster management responsibilities for the NDRMC. The Minister with portfolio responsibility for DRM is the Vice-Chair of the NDC. ODPEM provides secretariat services to the NDC and the Director General of ODPEM is designated as National Disaster Coordinator.

The NDC is divided into six sub-committees. Health – chaired by the Ministry of Health, Emergency Operations, Communications and Transport chaired by the Jamaica Fire Brigade, Public Information and Education chaired by the Jamaica Information Service, Administration, Finance and Planning chaired by the Ministry of Finance, Welfare,

Shelter and Relief chaired by the Ministry of Labour and Social Security and Damage Assessment, Recovery and Rehabilitation chaired by the Ministry of Transport. Membership of these committees includes public and private sectors, NGOs and donor partners. These committees contribute to policy, programme and plan development, review plans and give technical guidance where necessary.

Members of the NDC are drawn from the public and private sectors, donor partners, NGOs and faith-based groups. The NDC meets at least once per year to review the status of the country’s DRM programme. It can also be convened as required by the Prime Minister. Importantly, the composition of the NDC and its sub-committees and its comprehensive mandate encompassing all aspects of DRM reflect the integrated approach to DRM practised in Jamaica.

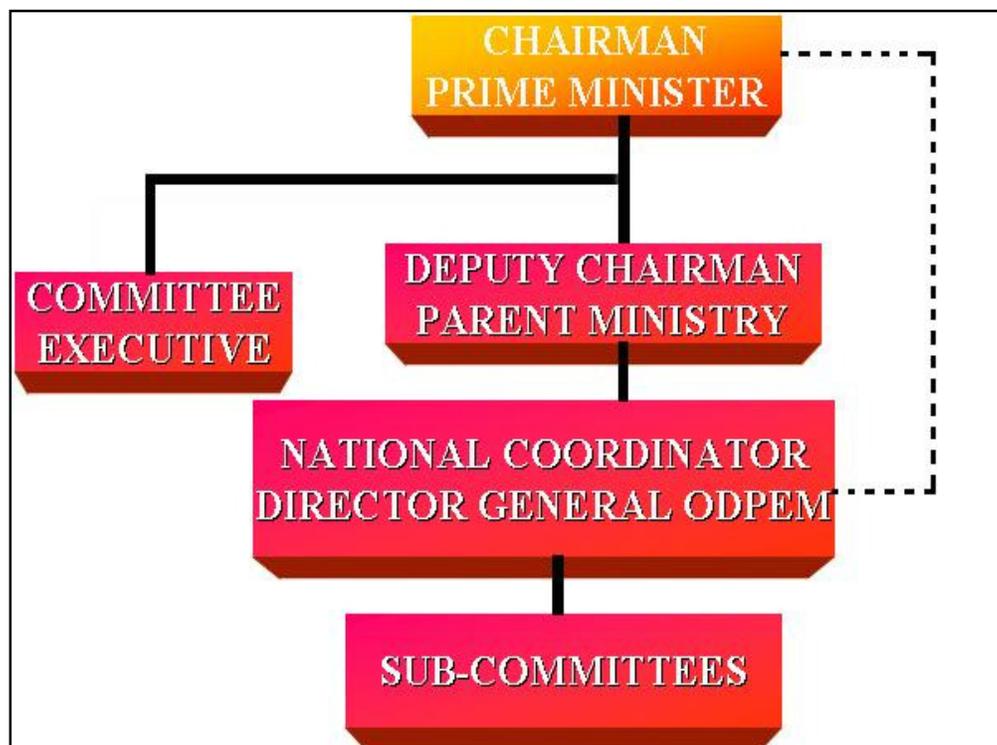


Figure 5.1: National disaster committee structure. Source: ODPEM 2012.

In addition, the island is divided into four regions, and Regional Disaster Coordinators, who are staff members of ODPEM are assigned to these regions and are responsible for monitoring existing disaster mitigation and preparedness arrangements in the parishes to which they are assigned, to ensure adequacy of relief supplies in times of disaster and to coordinate response to emergencies (NDP 1997). A Regional Disaster Coordinator also chairs the Regional Disaster Planning Group which consists of other regional coordinators and local officials.

Parish Level

DRM in each parish is managed by a Parish Disaster Committee (PDIC) which mirrors the National Disaster Committee in its composition. The PDIC is chaired by the Custos or Mayor of the parish (see Figure 5.2). Other members include all Parish Councillors and local representatives of the government agencies, NGOs the private sector and other interested groups²⁷. Each parish appoints a Parish Disaster Coordinator who has day to day responsibility for the parish programme and acts as liaison with ODPEM.

The Parish Disaster Coordinator is also responsible for developing preparedness and response plans in keeping with ODPEM guidelines as well as coordinating all public awareness, prevention and response activities within the parish. Operations are conducted out of a Parish Emergency Operations Centre (PEOC) operated by the PDICs within the Parish Council Offices. The PDICs forge partnerships with the different response agencies, community groups and community-based organisations within the parishes.

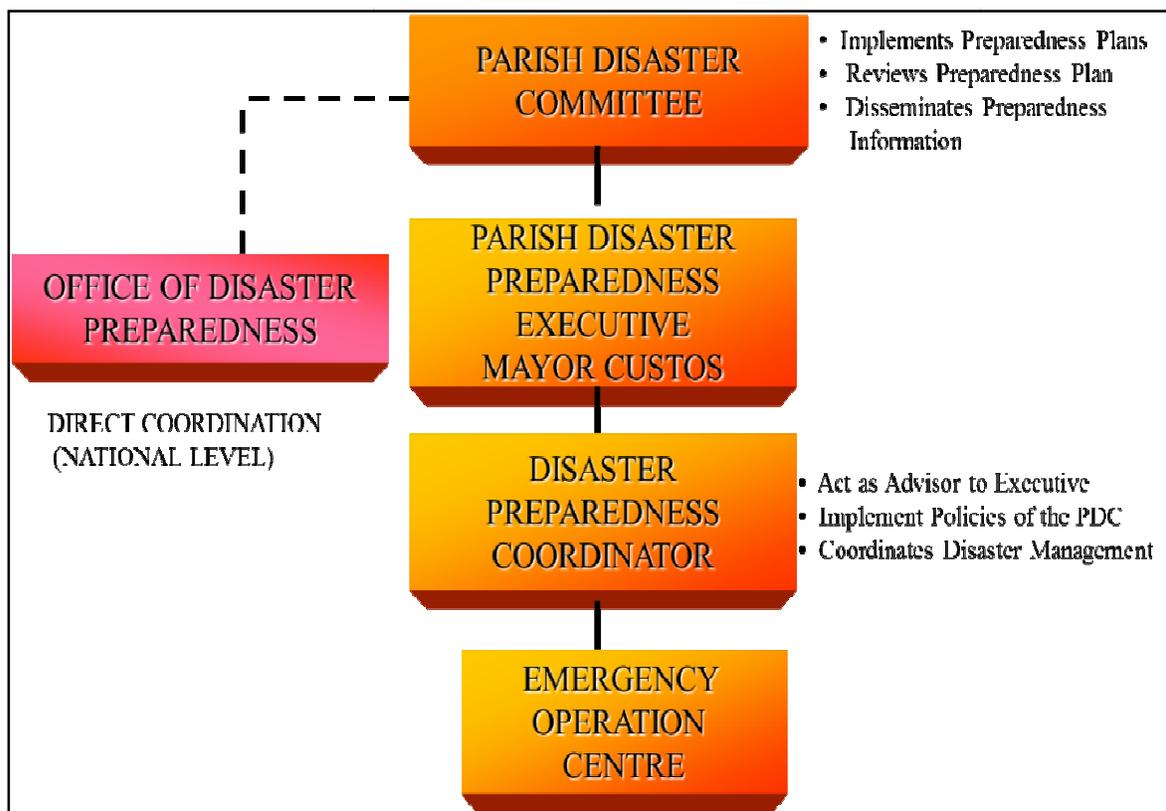


Figure 5.2: Parish disaster committee structure. Source: ODPEM 2012

Zonal Level

At the community level a national zonal programme developed by ODPEM divides the island into clusters of communities called zones. The zones are then divided into focal points. The National Zonal Committee is the coordinating body for the National Zonal

²⁷<http://www.odpem.org.jm/>

Programme and is tasked with monitoring all aspects of the programme including development of public education programmes, fund raising and preparing detailed Policy/Mission Statements. It is made up of an Administrative Chairman and three Sub-committees (Figure 5.3).

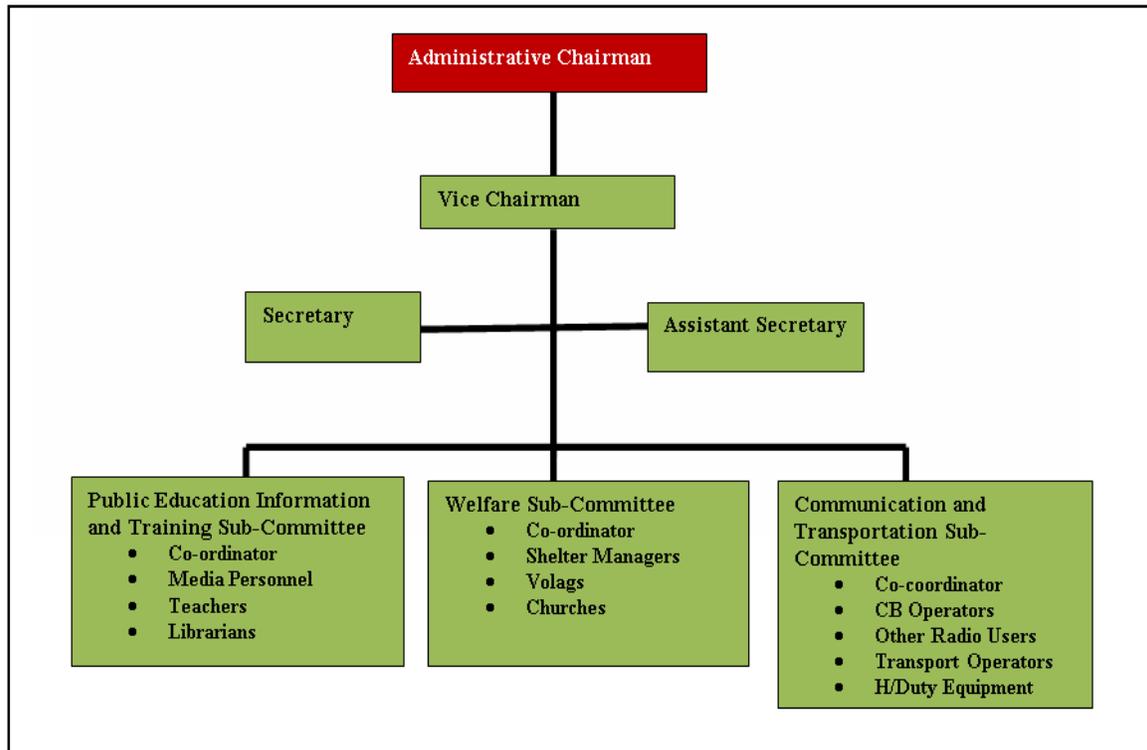


Figure 5.3: National zonal committee structure. Source: ODPEM 2012.

A zone chairman monitors each zone and provides information on disasters or potential disasters to the PDICs. He/she must identify resources, that is, personnel, equipment, (like cellular phones) and also heavy duty equipment and operators in the event they are needed.

When a disaster occurs the zones will be the first group to render assistance in communities. The zonal headquarters is transformed into a communication, coordination and distribution centre from which agencies like the Red Cross and the Salvation Army among others give assistance to affected persons.

There are a number of focal points that operate on a smaller scale and collaborate with the zone chairman. These focal points provide information to zones regarding the state or level of disaster impact and response within their communities. Additionally, the focal points also identify resources and ensure their availability for use during times of need.

The Social Development Commission (SDC) is the government agency which works in community development. Their programme includes development of community priority plans as well as economic development planning. The SDC also includes development of

community DRM plans as part of its intervention in communities which have not developed such plans.

Community Level

The structure at community level varies, but generally community based disaster risk management groups (CBDRM) are encouraged to elect a chair, vice chair, secretary and treasurer. The final structure depends on the resources available in the community; sub-committees for public education and training, communications and transport and welfare are usually established. Community groups are also responsible for community early warning systems where these exist.

Jamaica has reported to the HFA on community participation and decentralisation. Achievements noted in the report include allocation of funding for DRR to local government authorities and establishment of community development funds. Community participation is included in the current disaster preparedness act and will be strengthened in the new legislation.

Constraints include inadequate resources for deployment at community level, need to strengthen the local authorities in order to more effectively carry out DRR activities and establishment of incentives for communities to participate in the Community-Based Disaster Risk Management (CBDRM) programme (HFA 2010).

Roles and Responsibilities of Key Stakeholders

The Office of Disaster Preparedness and Emergency Management (ODPEM)

The national DRM programme is led by the Office of Disaster Preparedness and Emergency Management (ODPEM) which by law is assigned responsibility for coordinating DRM in Jamaica. The national system designates lead agencies or organisations which assume responsibility for appropriate subject areas. ODPEM leads the process of development and implementation of the national DRM programme; national policies, plans and the development and revision of the DRM legislation.

Government Ministries/Departments/Agencies

Government Ministries retain responsibility for management of DRM matters under their portfolios. Each Ministry is represented on the National Disaster Committee by its Permanent Secretary or designate. Government Ministries are responsible for integrating DRR into their programmes and plans. In addition to parent ministries, there are several departments and agencies which are also represented on the National Disaster Committee.

Scientific and Technical Agencies

These agencies are represented on the National Disaster Committee and its sub-committees. Generally, they are responsible for forecasting and warning, hazard mapping, risk analysis, scenario development, development and updating of building codes and zoning laws as well as technical support for response operations.

First Responders

The Jamaica Fire Brigade, the Jamaica Constabulary Force, the Jamaica Defence Force, the Ministry of Health and other entities are designated as lead agencies for various hazards.

Private Sector

The private sector ensures that business continuity plans are in place and lends support to ODPEM and the NDC, often providing sponsorship for certain aspects of the national DRM programme.

Non-Governmental Organisations (NGOs)

A variety of NGOs are involved in interventions and training mainly at the community level. The Jamaica Red Cross and the Adventist Disaster Relief Agency are both part of the Welfare Team in place for support to affected persons during disaster response.

Donor Partners

Donor partners give support to the national programme, usually through grants and soft loans. The United Nations Development Programme (UNDP) in conjunction with the Ministry of Foreign Affairs and Foreign Trade, acts as coordinator for the donor and international communities during response.

Community Based Organisations (CBOs)

Community Based Organisations including community-level preparedness and response teams carry out CBDRM programmes at the community level. Community-based DRM groups are monitored by the Parish Disaster Committees but also receive support from ODPEM.

Academic Institutions

These carry out research and provide technical support to ODPEM in the area of DRR in Jamaica.

Disaster Risk Reduction and Climate Change Adaptation

Jamaica recently established a Ministry with responsibility for climate change as well as a Climate Change Division. Under the country's National Development Plan – *Vision 2030 Jamaica* – a Thematic Working Group on Hazard Risk Reduction and Climate Change Adaptation (HRR-CCA) was established to coordinate integration in these areas. The working group is jointly chaired by ODPEM and the National Meteorological Service of Jamaica, and includes representation from academia, NGOs, the public sector and donor partners.

Vision 2030 Jamaica enunciates four national strategies for Hazard Risk Reduction and Climate Change Adaptation. These are:

- 1 Improve resilience to all forms of hazards;
- 2 Improve emergency response capability;
- 3 Develop measures to adapt to climate change; and

- 4 Contribute to the effort to reduce the global rate of climate change.

These are to be achieved by sector strategies including:

- 1 Use of predictive tools for modeling, hazard mapping and risk assessment;
- 2 Modernising the legal framework;
- 3 Inclusion of hazard risk reduction in the education curricula and research agenda
- 4 Incorporate hazard risk reduction in environmental and natural resources management;
- 5 Establish mechanisms for increasing resilience of the poor and most vulnerable;
- 6 Establish measures to incorporate hazard risk reduction in land-use practices and human settlements; and
- 7 Design human settlements that are not vulnerable to hazards based on construction and rehabilitation techniques that enhance the long term usability.

Other strategies include inclusion of civil society and the private sector and promotion of business continuity planning, regulation of hazard materials, expansion of early warning systems, among others.

In 2011 Sector Planning Workshops were convened to prepare the new *Medium Term Socio-Economic Policy Framework 2012-2015*. The HRR-CCA Thematic Working Group was part of the planning process and priorities for HRR and CCA were included.

The importance of the DRR-CCA nexus is recognised as many projects include both climate change adaptation and disaster risk reduction elements (Appendix 4). For example, the PIOJ recently was successful in accessing grant funding from the Adaptation Fund (AF). The *'Enhancing the Resilience of the Agriculture Sector and Coastal Areas to Protect Livelihoods and Improve Food Security Project'* (also called the AF Project) addresses livelihoods security for the tourism sector in Negril and small farmers across several parishes. The project is providing irrigation, improved land husbandry and soil management techniques as well as development of disaster risk reduction plans taking into account climate variability and climate change at the community level.

5.3.2 NATIONAL PLANS AND THEIR IMPLEMENTATION

The *National Disaster Plan* provides the framework for mitigation, preparedness, response and recovery for hazards to which Jamaica is exposed (NDP 1997). Although the NDP provides guidelines for disaster management in Jamaica, there is still need for a comprehensive policy on disaster management.

There are several Sub Plans of the National Disaster Plan, these include but are not limited to the following:

- National Hurricane Plan
- National Earthquake Plan
- National Drought Management Plan
- National Oil and Hazardous Materials Spill Plan

- National Aircraft Crash Plan
- Hazardous Materials Response Plan
- Joint-Portmore Evacuation Plan
- National Fire Management Plan
- National Damage Assessment Plan
- National Mass Casualty Plan
- Major Epidemic Plan
- National Animal Diseases Plan
- National Recovery Plan
- Overseas Assistance Plan
- Hazard Response Plans
- Shelter and Welfare Plan and Policy
- Parish Disaster Plans
- Community Disaster Plans
- National Influenza Pandemic Preparedness Plan
- National Emergency Telecommunication Plan

Several national plans have been revised, including the *National Chemical Response Protocol*, the *National Damage Assessment Plan*, the *National Welfare Plan*, the *National Oil Spill Plan*, and the *National Emergency Telecommunication Plan*. A notable omission from the NDP is a plan covering continuity of government operations after a major disaster.

Under the CBDRM programme, community DRM groups develop their community plans. ODPEM provides a model plan which communities use as a guide in writing their plans.

Operational Framework

Management of emergencies and disasters is coordinated by Emergency Operations Centres (EOCs) staffed by multi-organisational teams. At the national level the National Emergency Operations Centre (NEOC) is located at ODPEM headquarters. At the parish level the Parish Emergency Operations Centres (PEOCs) are located at the offices of the Parish Councils. Representatives of public and private sectors, NGOs and CBOs comprise the teams which manage impact of hazard events in Jamaica.

Structure

The EOC is managed by an EOC Director which at national level is an ODPEM senior staff member. The EOC Staff is divided into six operational groups:

1. Health and Welfare coordinated by the Ministry of Health and the Ministry of Social Security;
2. Public Utilities coordinated by the Ministry of Works;
3. District Committees coordinated by a District Coordinator (ODPEM);

4. Emergency operations coordinated by the Jamaica Fire Brigade;
5. Communications and Public Information coordinated by the Jamaica Information Service; and
6. Administration chaired by the Ministry of Finance.

The function of each of these groups is shown in Figure 5.4 below:

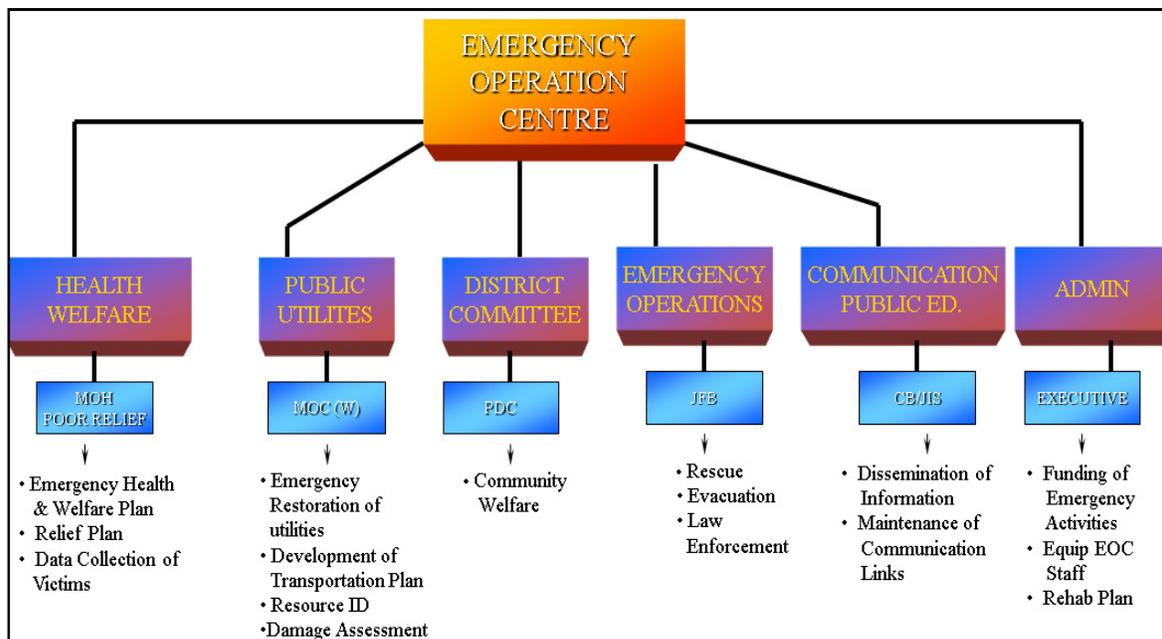


Figure 5.4: Structure of the EOC. Source: ODPEM 2012.

The EOCs operate for twenty-four hours for as long as necessary, using a shift system. They are responsible for coordination of all short-term preparations consequent on warning and alerts, as well as response and initial recovery activities. EOC activation is governed by the National Disaster Plan which sets out conditions and trigger levels for activation by the Director General, ODPEM in consultation with the Prime Minister. The NEOC Director is responsible for ensuring information flow to the policy level as well as the public – this is usually done by regular situation reports.

The NEOC has the responsibility of coordinating relief efforts, and maintains contact with the international and donor community coordinated by UNDP and the Ministry with responsibility for Foreign Affairs, and the regional community, through CDEMA.

Financing for operations is taken from ODPEM’s budget, budgets of other agencies and ministries and the National Disaster Fund.

Recovery planning and implementation are managed either by organisations specially established for the purpose or by a designated Ministry or agency. ODPEM manages community-based recovery projects. During recovery efforts are made to include risk

reduction measures, such as ensuring that replacement roofs are designed to the correct pitch and built with hurricane straps, and that replacement housing sites undergo technical evaluations before being approved. There is no dedicated risk reduction or recovery fund. Funds for recovery must be taken from re-allocation of budgeted GOJ funds or external grants.

5.4 SUMMARY

Several laws and other legal provisions are used by various agencies to achieve their roles and responsibilities in DRM/DRR. DRM/DRR programmes are coordinated by ODPEM and guided by the *Disaster Preparedness and Emergency Management Act* (1993) which provides operational and administrative procedures for reducing disaster related risks as well as regional and international frameworks such as CDM and the HFA.

The other legally binding provisions such as the *Kingston and Saint Andrew Corporation Act* (1931), the *Defence Act* (1962), the *Fire Brigade Act* (1988), the *Country Fire Act* (1942), *Parish Councils Act* (1887), *Water Resources Act* (1995), *Town and Country Planning Act* (1958), *National Solid Waste Management Act* (2002), *Public Health Act* (1974), *National Resources Conservation Authority Act* (1991), the *Parochial Rates and Finance Act* (1900), the *Kingston City Corporations Act* (1923), the *Poor Relief Act* (1867), the *Municipalities Act* (2003) and the *Building Act* (2011) provide support to the main legal authorities. However, the enforcement of these provisions is often lacking. Effective enforcement of these provisions is required for DRR to be achieved. In addition, greater coordination among and within the responsible agencies and organisations would more efficiently use resources and build synergies. For example, the formation of enforcement teams of trained building inspectors and other technical persons with specific responsibilities deployed together would increase enforcement across the island.

A number of the laws and other legal provisions identified can be considered as outdated. An example of this is the DPEMA (1993), which has been repealed and replaced by the *Disaster Risk Management Bill*. The new Bill was recently passed in the House of Representatives with minor changes and was approved by Senate in November 2014. It will create an enabling environment for changing disaster management practices as it will address some elements of risk management, evacuation, no build zones and sanctions for breaches of the Act. Similarly, other laws and legal provisions should be revised especially where sanctions and fines for particular offences are concerned. In addition, laws and/or legal provisions awaiting enactment such as the *National Building Code (draft)* should be passed in to law. The research being done under the review of humanitarian assistance related laws will identify gaps which should be addressed. The results of the research from this project should be useful in informing the revision of other legislation.

Varying policies, frameworks and action plans have been developed for Jamaica relating to DRM/DRR. These plans and policies outline procedures for pre and post hazard impact as well as recovery support. Most of these plans are utilised by ODPEM which is the central authority during disaster events. The plans also address several of the hazards affecting Jamaica. The main agency and the supporting agencies/organisations are identified along with their defined roles and responsibilities.

The NDP, the overarching plan related to DRM/DRR in Jamaica, is more than 15 years old and requires updating to address pertinent issues such as the relocation of informal settlements, evacuation of vulnerable groups (children below 15 years, elderly over 65 years and the disabled) during hazard events and the related impacts of climate change. It is important to note that the *Hazard Mitigation Policy* or a derivation thereof, has been in draft stage since 1999 and is yet to be fully implemented. However several projects and programmes on DRR and CCA have been implemented.

The NHRP provides support for activities at all levels including the community, parish and national level. Community level mitigation projects have focussed on the building of resilient communities, preparedness and emergency response teams and support to CBDRM. Parish level mitigation projects have focussed on DRM training for Parish Councils and hazard/risk assessments and hazard mapping in several parishes. The national level projects have focussed on natural hazard management in areas that are vulnerable to multiple hazards, including urban coastal towns. ODPEM encourages partner agencies and organisations to incorporate hazard mitigation into their planning activities. Although the NHRP is successful in addressing some of the key areas related to risk reduction, the policy has not been disseminated on a large scale. However, ODPEM “has been implementing a three year strategic plan for DRR. This strategy while comprehensive is not fully integrated in key sectors and agencies” (ODPEM 2011, p. 6)

The *National Influenza Pandemic Preparedness Plan* and the *National Framework for Pandemic Management* are important in addressing health-related threats and airborne diseases. Within the framework of the national plan, work is on-going at the parish level to develop parish pandemic plans. Making these plans operational must be a priority in light of recent emerging threats associated with the Chikungunya and Ebola outbreaks.

The *National Oil Spill Plan* was recently updated to improve coordination relating to preparedness, clean-up and response to oil spill events as well as based on past events as mandated. The Plan provides detail objectives and procedures for activating the plan as well as outlining the roles of different organisations in the preparedness, clean-up process, and recovery process. Jamaica's susceptibility to oil spills, given its location in shipping lanes and reliance on crude oil is evident. The proposed development of the Trans-shipment Hub in the Portland Bight Protect Area (PBPA) to accommodate vessels transiting the expanded Panama Canal presents a threat to Jamaica's marine ecosystem and human welfare from spills and other potential hazards resulting from accidents involving these large vessels.

The *National Emergency Chemical Spill Response Protocol* was also updated in response to an increase in events of chemical spills and the need to ensure that Jamaica will effectively manage these events. The Protocol outlines the country's plan of action for chemical emergencies, both ashore, and within Jamaica's waters. It is important to note that the protocol is of considerable significance to Jamaica's response mechanism, as it regards technological hazards.

Other national plans that have been revised include the *National Damage Assessment Plan*; the *National Welfare Plan*; and the *National Emergency Telecommunications Plan*. In addition, Jamaica made some progress in ratifying the *International Aid for Search and Rescue Protocol*.

Substantial achievement has been attained with regards to mechanisms for DRM, disaster preparedness plans and contingency plans but efforts are limited by challenges such as financial resources and/or operational capacities of agencies. National plans and sub plans have been developed to address key areas of the disaster cycle such as preparedness, prevention, mitigation, recovery and response.

The *Climate Change Policy and Action Plan (draft)* developed by the MWLECC is currently being revised for White Paper submission. Jamaica is a signatory to the United Nations Framework Convention on Climate Change (UNFCCC) and its *Kyoto Protocol* geared at reducing GHG emissions (MWLECC 2014). Jamaica is a non-Annex 1 country and does not have GHG restrictions or targets under the *Kyoto Protocol*. The draft policy assesses future threats and potential impacts of climate change in Jamaica while highlighting the vulnerability of key sectors such as agriculture, health and tourism as well as key resources such as water and land. The institutional framework highlights key stakeholders such as the Meteorological Services of Jamaica, ODPEM, PIOJ, WRA and the Climate Studies Group Mona (CSGM) that are equipped to monitor, mitigate and respond to potential climate change impacts. Challenges facing Jamaica in addressing climate change in the short, medium and long-term were identified and discussed within the policy. Challenges include, but are not limited to, high incidence of poverty, limited financial resources, limited legislative and regulatory support for the integration of climate change considerations in laws and policies, limited institutional and individual capacity, a weak physical planning system and limited research capacity and technological development (MWLECC 2014).

There is a National Disaster Fund but it is not adequate to address events of a significant nature due to its limited capacity (ODPEM 2011; ODPEM 2013). As such, financial efforts towards recovery after hazard events result from budgetary diversions, the sourcing of loans/grants and support from the private sector are sometimes used to respond to large scale events. The newly approved DRM Bill (2014) will make provisions for annually contributions to be made to the NDF.

The draft *National Hazard Mitigation Policy* (1999) provides the framework for the national approach to DRM/DRR. This is supported by sectoral plans such as the

National Agriculture Disaster Risk Management (ADRM) Plan. In addition, DRM is integrated into other policies such as the *National Security Policy* and *National Food Security Policy*. This suggests an increasing awareness of DRR and its cross-cutting nature.

Jamaica has well developed plans for DRM. The plans reflect a comprehensive approach to disaster risk management as they include not only preparedness and response, but also mitigation and recovery. They also reflect an integrated approach as the roles of all players are captured, including the private sector, NGOs and donor partners. The challenge of keeping plans updated must be addressed; however this may better be done after the updating of the DPEM legislation in order to reflect the changes in that Act relating to the national plans.

Under the HFA, PFA 1 is aimed at ensuring that DRR is a national and local priority with a strong institutional basis for implementation. As highlighted, a legal framework for DRR exists with decentralized responsibilities and capacities at all levels. While progress has been made in DRR, limitations such as financial resources and/or operational capacities have hindered such progress (ODPEM 2011). However, continuous effort is being given to the integration of DRR into development plans and strategies to reduce risk.

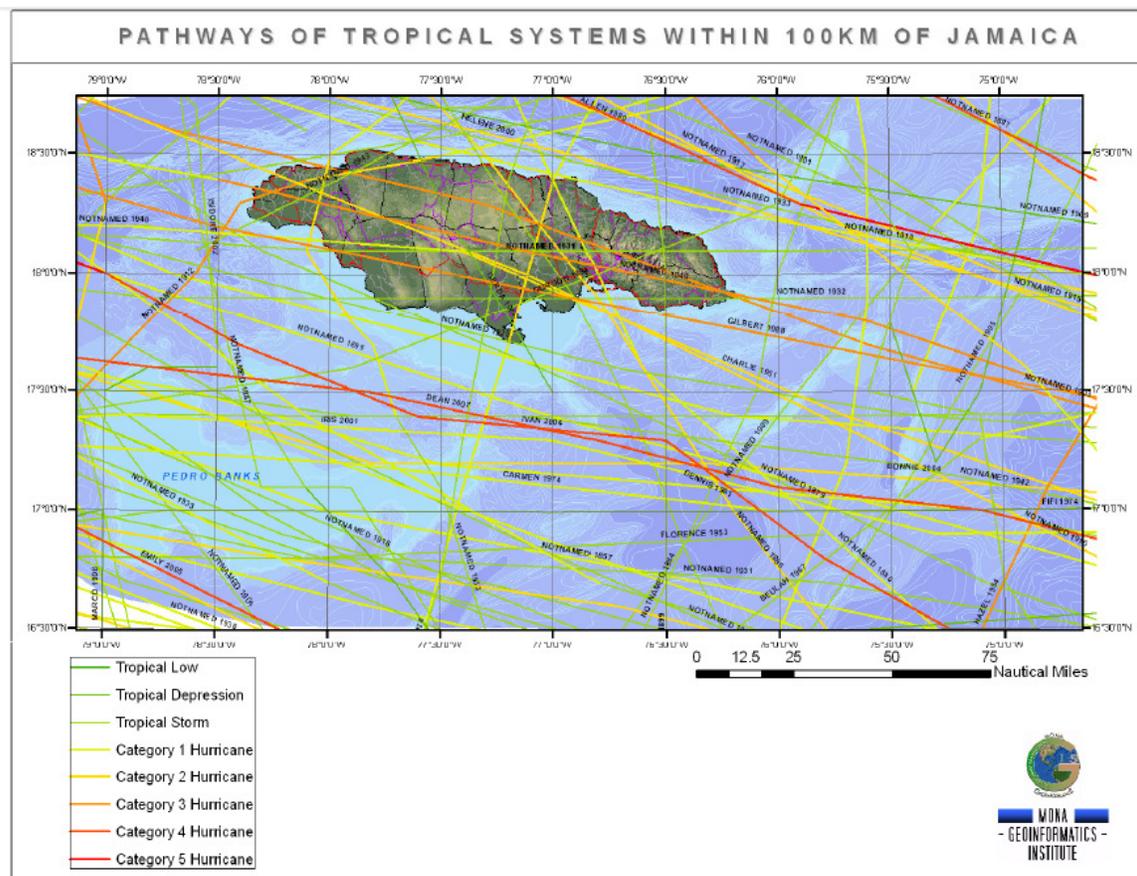
6.0 THE STATE OF DISASTER RISK IN THE COUNTRY

6.1. HISTORICAL DISASTER ANALYSIS

Jamaica has been impacted by several natural disasters and emergencies caused by extreme weather events, earthquake and diseases (NDP 1997). Meteorological hazards in the form of tropical cyclones (hurricane and tropical storms), storm surges, floods and drought are frequent recurring hazards with high potential impacts. Although there has been no major earthquake since 1907, the impact of such an event could be devastating.

Hurricane and Tropical Storms

The hurricanes of 1722, 1744, 1780, 1880, 1920, 1903, 1944, 1951 (Charlie), 1963 (Flora) 1988 (Gilbert), 2004 (Ivan), 2005 (Emily and Charley), 2007 (Dean), 2008 (Gustav), 2010 (Nicole) and 2012 (Sandy) caused severe damage and loss of lives in Jamaica. Storms occurring over the last decade have caused loss of lives and significant property damage resulting in millions of losses (Table 5). A number of hurricane and tropical storms have made direct impact or have passed within close proximity (100km) of the island as highlighted by Map 6.1.



Map 6.1: Pathways of tropical cyclones within 100km of Jamaica. Source: MGI 2012.

Hurricane Gilbert passed directly over Jamaica as a Category 3 hurricane on September 12, 1988. The entire island was affected with critical facilities such as hospitals, schools and water pipelines being damaged by strong winds, heavy rainfall and storm surge along coastal areas. This resulted in wide scale flooding, landslides and loss of roofing for the majority of buildings. All sectors of the economy were affected. It was estimated that *“between 200mm and 250mm of rainfall fell on September 12 and this reached more than 400mm in central areas”* (PAHO 1989, p3). Damage resulting from Hurricane Gilbert was estimated at US\$4 billion, with agriculture accounting for over 40 per cent of this total (PAHO 1989). Hurricane Gilbert claimed 49 lives, affected 810,000 persons and became one of the most expensive natural disasters in Jamaica’s history (GFDRR 2010).

Hurricane Ivan affected Jamaica between September 10 - 12, 2004 as a Category 4 hurricane passing south of the island (Map 6). Impacts from Hurricane Ivan were caused by strong winds, heavy rainfall (up to 720mm) and storm surge especially on the south coast of the island (Plate 2 and 3). These resulted in varying impacts on the economy with losses equivalent to 8 per cent of GDP for 2003 (Table 5). Damage resulting from Hurricane Ivan was estimated at JA\$35,931 million (US\$580 million), with physical assets accounting for over 62 per cent of this total (ECLAC 2004). Hurricane Ivan claimed 17 lives, affected 369,685 persons across the island and damaged 14 per cent of the housing stock mostly in Clarendon, St. Elizabeth, Westmoreland, Kingston and St. Andrew, and Manchester (GFDRR 2010).



Plate 6.1: Sediments deposited along the Palisades roadway after Hurricane Ivan (2004). Source: NWA 2012.



Plate 6.2: Protection of the Palisadoes roadway. Source: NWA 2012.

Event	Year	Category	Cost (\$JB)	Impact (per cent GDP)	Deaths
Hurricane Michelle	2001	4	2.52	0.8	5
May/June Flood Rains	2002	-	2.47	0.7	n/a
Hurricane Charley	2004	4	0.44	0.02	1
Hurricane Ivan	2004	3	36.9	8.0	17
Hurricane Dennis and Emily	2005	4	5.98	1.2	7
Hurricane Wilma	2005	5	3.6	0.7	1
Hurricane Dean	2007	4	23.8	3.4	6
Tropical Storm Gustav	2008	-	15.5	2.0	20
Tropical Storm Nicole	2010	-	20.6	1.9	16
Hurricane Sandy	2012	1	9.7	0.8	1

Table 6.1: Economic and human impacts of selected storm events on Jamaica. Source: Edited from multiple sources.

Late in the 2012 hurricane season, October 24, 2012, Jamaica was impacted by Hurricane Sandy moving from south to north on its path across eastern Jamaica. The estimated \$9.7 billion total loss and damage from Hurricane Sandy represents 0.8 per cent of 2011 GDP (PIOJ 2013). Essential services such as electricity, water and sanitation, transport and communication were the worst hit especially in eastern parishes such as St. Thomas, Portland, St. Mary, St. Andrew and St. Ann (Plate 6.3). Similarly, the agriculture, tourism, education and the health sectors as well as the physical environment were severely impacted.



“Approximately 25.2 per cent of the total population or some 681,018 persons from 123 communities were directly and indirectly affected by the natural disaster” (PIOJ 2013, p. iv).

Plate 6.3: Destruction of a bridge spanning the Hope River in Kintyre, St Andrew.
Source: NEPA 2012.

Floods

“A flood can be defined as an abnormally high stream flow, which overflows the natural or artificial banks of a stream or river” (Smith 2007, p. 16). According to Smith (2007), different types of flooding have been recorded such as:

1. Flash floods - these often result from heavy rainfall or cloudbursts over a relatively small drainage area.
2. Riverine Floods - these generally result from large amounts of rainfall falling in river systems with tributaries that drain large land areas.
3. Land Based Flooding - some land areas can be subject to large amounts of rain in a short time on characteristics such as slope angle, soil porosity, shape and size of the river basin or catchment area and state of deforestation.
4. Ponding - ponding of water is known to result from a slow build up in depressions, sinks, and areas with soil substrates having a clay base and/or slow percolation rate.

Flood events resulting from heavy or prolonged rainfall in 1979, 1986, 1991, 1996, 2001 and 2002 caused damage in the parishes of Portland, Clarendon, Manchester, St.

Catherine and St. Elizabeth. The 1986 flood event started on May 23 and ended on June 6. Intense rainfall led to severe flooding in central Jamaica, with average water depths of 2.4 meters (8 feet) covering the central and southern plains (Smith 2007). According to Smith (2007, p. 20), “*some areas experienced inundation of up to 4.6 meters which resulted in 46 deaths, over 7,300 ha of crops were lost, and damage to roads and other infrastructure was extensive. The cost of damage (direct damage) was estimated at J\$415 million (75.5 million dollars)*”.

It is also important to note that flood events were also associated with hurricanes and tropical storms such as Hurricane Ivan (2004), Hurricane Dean (2007), Tropical Storm Gustav (2008), Tropical Storm Nicole (2010) and Hurricane Sandy among others (Plate 6.3, 6.4 and 6.5). The impact of the 2001 flood event was estimated at J\$2,470 - 2,521 million representing 0.7 - 0.8 per cent of the 2000 GDP (Table 6.1), while the flood events in 1991 and 1996 killed 69 persons and affected a total of 591,340 people (GFDRR 2010).



Plate 6.4: Flooding in New Market after the passage of tropical storm Nicole (2010). Source: PIOJ 2010.

NB. New Market was flooded in October 2010 and ponded water was still evident in February of 2011.

Since the start of 2014, a number of flooding events have been recorded. In January 2014 the eastern parishes of Portland and St. Mary were severely affected following two days of torrential rainfall (Plate 6.5). The initial clean-up cost for affected roads was estimated at JMD \$33 million, and the estimate for permanent works in St. Mary was JMD \$125 million (Dunkley-Willis 2014). Similar incidents occurred in May 2014 when Western Jamaica was affected (resulting in the death of two school children) and, July 2014 in which southern Clarendon communities were impacted. During September 2014, several roads in Portland were blocked or reduced to single lane resulting from landslides caused by heavy rainfall over a 48 hour period.



Plate 6.5: Flooded roadway leading to St. Mary. Source: The Jamaica Observer 2014.

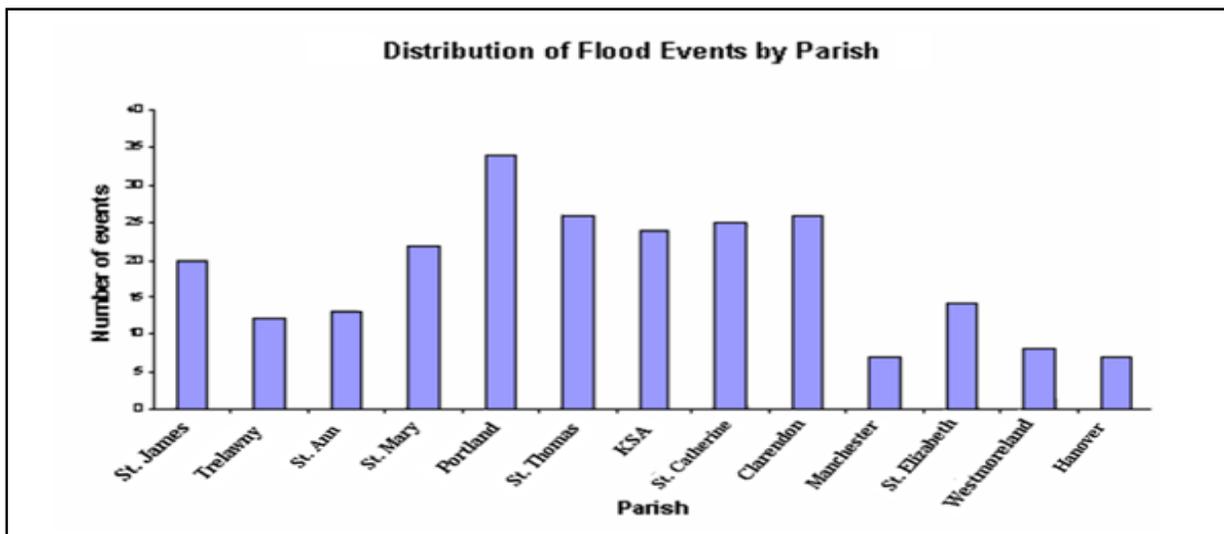


Figure 6.1: Distribution of flood events by parish (1884-2000). Source: Smith 2007.

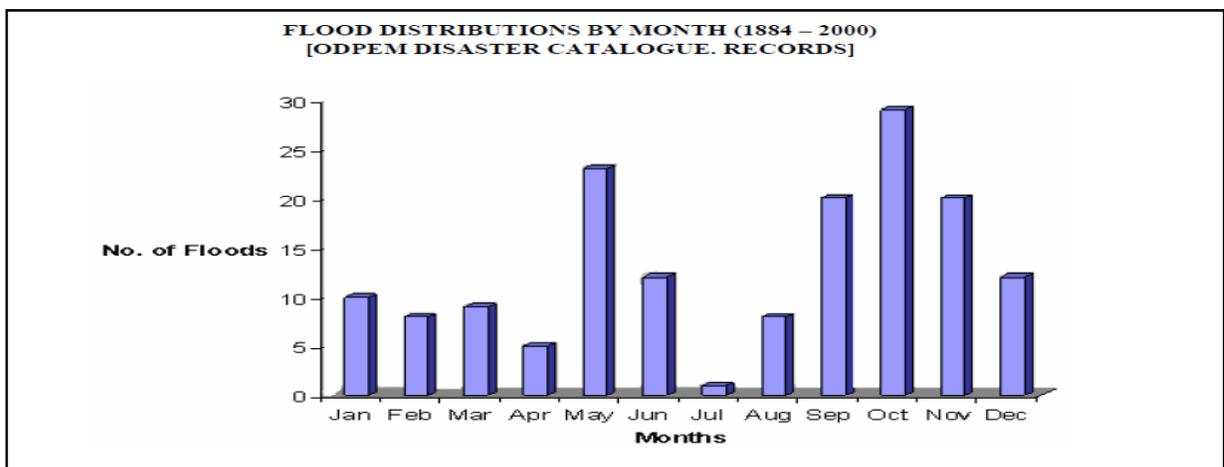


Figure 6.2: Distribution of flood events by month (1884-2000). Source: Smith 2007.

Droughts

Droughts are usually defined as the sustained occurrence of below average natural water availability, sourced either from rainfall, river runoff or groundwater²⁸. Droughts are usually classified as agricultural, hydrological or meteorological drought. According to the National Meteorological Service of Jamaica²⁹, the above-mentioned droughts are defined as follows:

- a. Agricultural drought – a period when soil moisture is inadequate to meet the demands for crops to initiate and sustain plant growth.
- b. Hydrological drought – a period of below average or normal stream-flow and/or depleted reservoir storage.
- c. Meteorological drought – a period of well-below average or normal rainfall (rainfall) that spans from a few months to few years.

A drought event may be considered to be normal, severe or extreme based on the percentage change of the calculated mean over an eight-week period compared to the 30-year mean for the same period.

Droughts experienced in the 1930's, 1980's, 1997 - 1998, 2009 - 2010 and 2013 - 2014 (ongoing) affected several sectors especially the agriculture and water sectors (Table 6.2). However, documentation of drought impact is not as comprehensive as that for other meteorological hazards.

Period	Impact/Comments	Total Estimated Losses
November 1996 – April 1998	Extensive meteorological drought across a number of parishes.	JA \$331.6 million
December 1999 – August 2000	Drought conditions affecting agriculture in several parishes.	JA \$250 million
January – March 2004	Extensive drought across a number of parishes.	JA 70 million
November – April 2005	Multi-parish drought conditions.	JA \$296 – 345.9 million
December 2007 – March 2008	Extensive drought across a number of parishes.	JA \$34.8 million
November 2009 – April 2010	Extensive drought across Jamaica	N/A
January – April 2013	Severe drought across mainly central and western parishes.	N/A
December 2013 – Ongoing	Extensive drought across Jamaica which affected mainly eastern and southern parishes (especially the agricultural sector).	Ongoing

Table 6.2: Estimated losses from drought events (mid 90's – 2010). Source: Information gathered from multiple sources.

²⁸<http://www.nicjamaica.com/Drought.htm>

²⁹<http://www.metservice.gov.jm/documents/documents/RainfallSummaryJanuary2012.pdf>

The 2009 - 2010 and 2013 - 2014 droughts were experienced regionally as several islands received below average rainfall for the period. The drought occurred over the predominant dry season but a reduction in rainfall during the preceding wet season influenced a period of dry conditions. In Jamaica, droughts also lead to an increase in bush fires, although the cost of managing these fires is not usually captured in loss estimates. The 2009-2010 and 2013-2014 droughts led to the activation of the *National Drought Management Plan*.

Impacts (direct and indirect) resulting from drought events are quite costly as indicated by Table 6.2. The agriculture sector is vulnerable to drought as most farmers depend on rainfall for their production. The unavailability of water during a drought event also affects activities within households and business establishments, as trucking operations and purchasing of water are very costly.

The National Drought Management Committee provides technical support to ODPEM in providing timing data and recommendations in response to the ongoing drought. In addition, a Prohibition Notice was issued by the Minister with responsibility for water, to restrict the use of treated water (water provided by NWC) for particular activities such as washing of vehicles and the filling of pools. The implementation of the Notice also made it illegal for persons to waste water.

The 2013 – 14 drought was considered to be severe in particular sections of the island. The Minister with responsibility for water highlighted that several parishes received below average rainfall which significantly reduced the inflows from springs and rivers into several facilities island wide (Table 6.3); *“Inflows into the Mona Reservoir from the Yallahs and Negro Rivers are now at 4.8 Million gallons per day, which is among the lowest since the construction of the Yallahs Pipeline in 1986. Currently we are receiving no inflows from the Hope River which is dry”*³⁰.

Parish	Per cent of 30 year normal rainfall
Clarendon	2%
Manchester	4%
St. Thomas	6%
St. Mary	8%
Kingston & St. Andrew	12%

Table 6.3: Impact of drought on the 30year mean rainfall for selected parishes. Source: JIS 2014³¹.

³⁰ <http://jis.gov.jm/statement-nation-hon-robert-pickersgill-m-p-minister-water-land-environment-climate-change-current-water-situation/>

³¹ Ibid.

In response to the drought, the National Water Commission (NWC) initiated a range of Emergency Water Management Measures tailored to meet the specific needs of all stakeholders³². These measures include:

- 1 Harnessing additional water for treatment and distribution from new and restored sources;
- 2 Maximizing abstraction from existing sources and especially groundwater sources;
- 3 Sharing of water from the least-affected systems with the worst-affected areas wherever possible;
- 4 Encouragement of conservation through public education, statements as well as advertising in all media;
- 5 Expediting ongoing water supply improvement projects; and
- 6 Re-deployed of water trucks especially to the most critical areas.

As it relates to planning and regulations, rainwater harvesting systems for developments will be enshrined within the building regulations. In addition, the *Water Sector Policy* and the *Rainwater Harvesting Policy* guidelines are being prepared and will be an integral consideration in the planning approval process going forward.

Earthquakes

The earthquake of June 7, 1692 estimated at 7.5 on the Moment Magnitude Scale (maximum MMI of X) is the strongest earthquake in the recorded history of the island (Smith 2007). Sections of Port Royal, which at the time was the island's commercial capital, sank as a result of liquefaction and several other sections of the island were affected by landslides and collapsed buildings. Secondary hazards resulting from this event included ground liquefaction, landslides, tsunamis and fires. It was reported that *"an estimated 2000 persons were killed immediately by the earthquake and the seismic waves that followed. An additional 3000 citizens died of injuries and disease in the following days"*³³.

The January 13, 1907 earthquake event estimated at 6.5 on the Moment Magnitude Scale (maximum MMI of IX) caused widespread building collapse and fire to commercial properties in Kingston and St. Andrew (Ahmad undated). The property losses were estimated between 1.5 and 2.5 million pounds (1907 value) and at that time Jamaica's export earnings were less than 1.5 million pounds (Ahmad 2001a). Losses resulted from severe damage to houses, utilities, agricultural and industrial activities in the parishes of Kingston and the lower sections of St. Andrew (Table 6.4). Landslides, liquefaction, tsunamis, fires and shoreline changes were among the secondary hazards. An estimated 1000 persons were killed and thousands left homeless or without basic amenities (Ahmad undated).

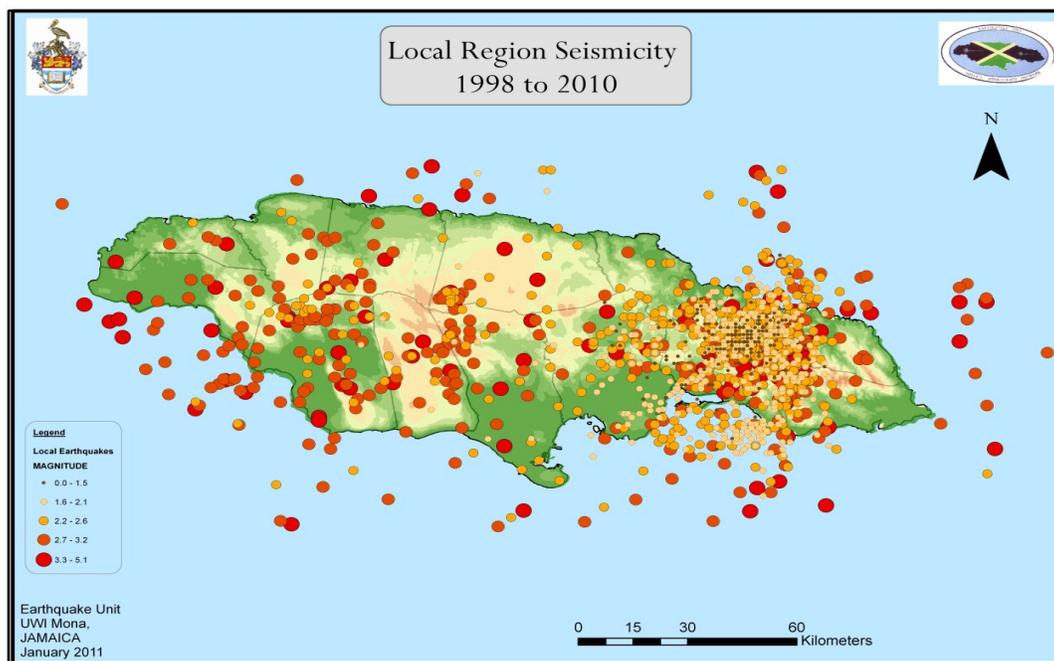
³² <http://jis.gov.jm/statement-nation-hon-robert-pickersgill-m-p-minister-water-land-environment-climate-change-current-water-situation/>

³³ http://earthquake.usgs.gov/earthquakes/world/events/1692_06_07.php

Damage (1907)	Cost (£)
Loss of buildings in the burnt area	500,000
Losses on private buildings in Kingston and suburbs of St. Andrew	900,000
Ecclesiastical buildings in Kingston	60,000
Merchandise and personal property in the burnt area	500,000
Ecclesiastical buildings out of Kingston	30,000
Other buildings in other parishes	20,000
	2,010,000

Table 6.4: Direct and indirect losses resulting from the 1907 Kingston earthquake. Source: Ahmad and Green 2005)

“During 2010, a total of 327 earthquakes were recorded. Of these, approximately 88 or 27 per cent were local on land and 120 or 37 per cent were near shore” (PIOJ 2012, p. 97). Although the data suggest a great deal of earthquake activity, only four (4) events were greater than magnitude four (4) on the Richter Magnitude Scale (PIOJ 2012). During the 2013 reporting period, 226 earthquakes were recorded, 6 more than 2012. However, eighty-three of these were land-based (PIOJ 2014). It is important to note that most of the earthquake activity occurred in the eastern section of the island (Map 6.3).

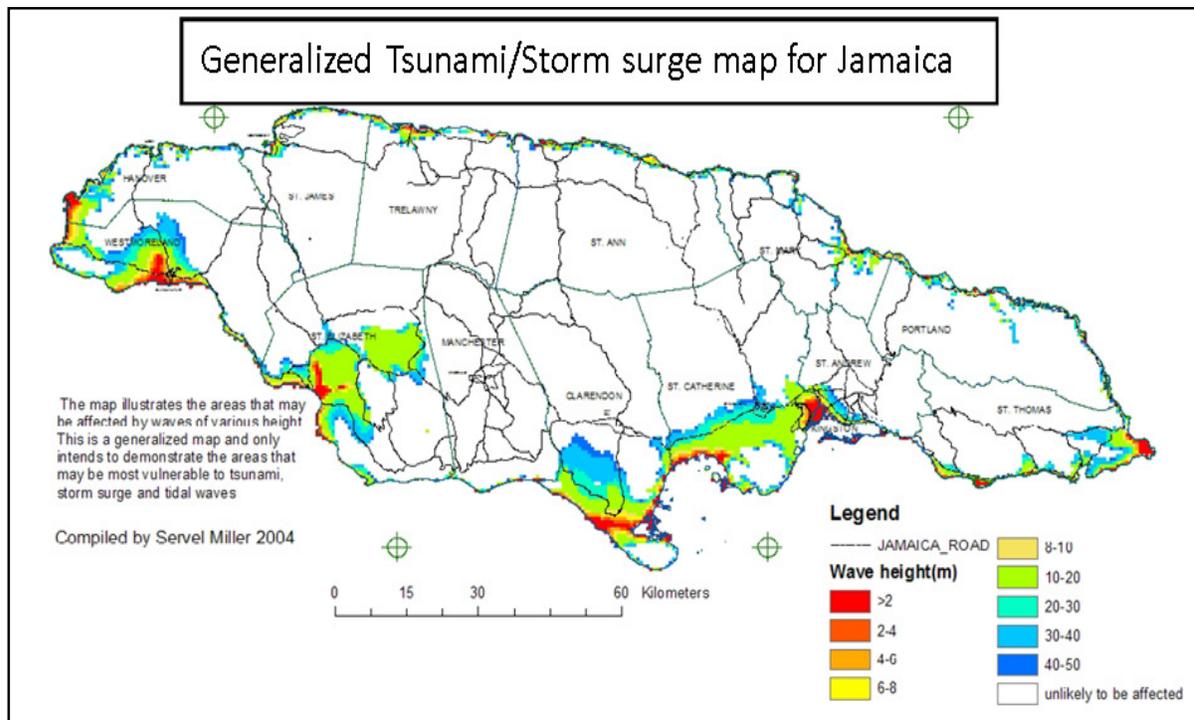


Map 6.3: Recorded earthquakes: 1998-2010. Source: Earthquake Unit 2012.

Tsunami

The area of the Caribbean Sea is geologically active in which earthquakes and volcanic activity are common. These geologic events have the potential to generate powerful tsunamis some of which are more devastating than the earthquake or volcanic eruption itself (Lander, Whiteside and Lockridge 2002). However, in recent history these events have been relatively rare within the Caribbean. The development pattern in Jamaica exposes a large per cent of the population to the effects of a tsunami. It is important to note that most tsunamis affecting Jamaica are related to landslides (Lander, Whiteside and Lockridge 2002).

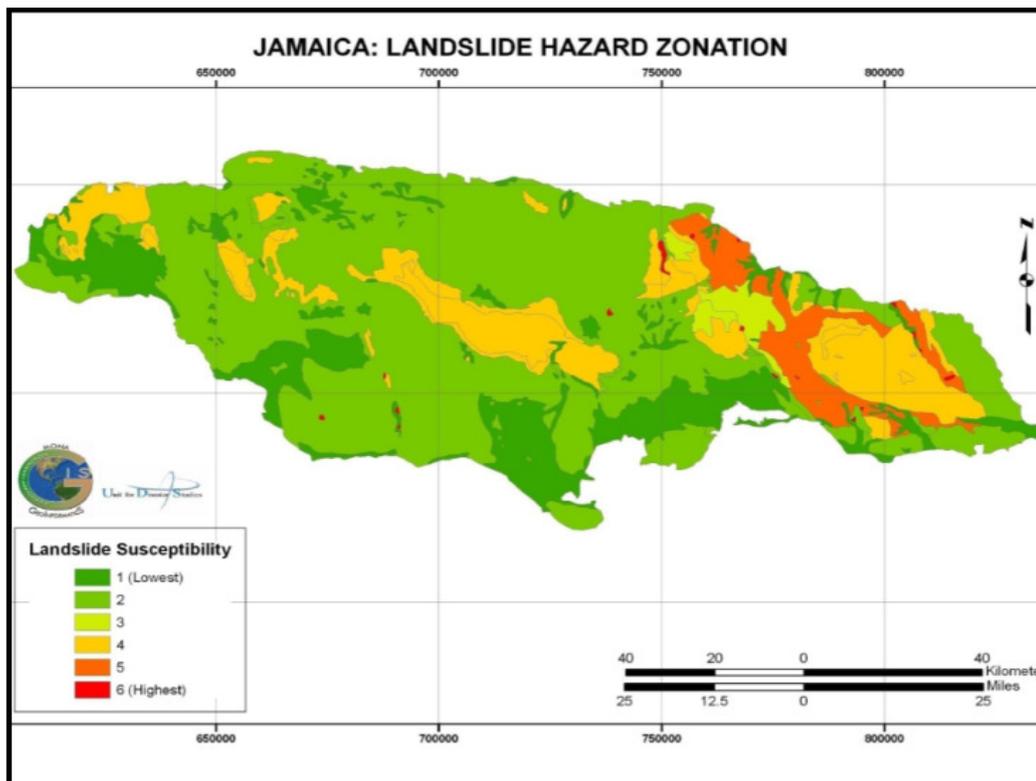
Tsunami impacts on Jamaica have been recorded from earthquakes (1692 & 1907) resulting from submarine landslides (within the Kingston Harbour). Other minor tsunami events have been recorded from sources within and outside of the Caribbean. The tsunami resulting from a submarine landslide within the Kingston Harbour caused by the 1692 earthquake destroyed ninety per cent of the buildings in Port Royal (Lander, Whiteside and Lockridge 2002). In addition, “A 1.8m wave crossed the bay and ships overturned” (Lander, Whiteside and Lockridge 2002, p. 63). A tele-tsunami generated off the coast of Lisbon, Portugal impacted Jamaica on November 1, 1755 (Smith 2007); “the tsunami had maximum observed amplitude of 6m, and an estimated return period of greater than 200 years” (Smith 2007, p. 38). Map 6.4 shows the potential inundation of Jamaica’s coastline based on varying tsunami wave heights.



Map 6.4: Generalized tsunami/storm surge map for Jamaica. Source: Miller 2004.

Landslides

Landslides in Jamaica usually occur in the hilly interior of the country or along steep slopes (Map 6.5). Major landslides in Jamaica include, but are not limited to, Judgement Cliff (1692), Preston (1986) and White Hall (2005 and 2009). In Portland, a landslide resulting from sustained rainfall from a weather system over the period January 3-4, 1998 caused four persons to be buried by debris and died (Ahmad 2001b). The National Works Agency (NWA) indicates that the cost of recovery initiatives for landslides is increasing. Since 2001 the cost for clearing landslide debris and constructing retaining walls averaged between JA\$230 and JA\$400 million per year (Smith 2007).



Map 6.5: Landslide zonation/susceptibility map. Source: MGI 2012.

Fires

Domestic Fires have resulted in loss of lives, one of the worst being the fire at the Eventide Golden Age Home on May 20, 1980 which claimed the life of 150 elderly women (Reid 2011). Although industrial fires are less frequent than domestic fires, the potential for significant damage to property and lives remains high.

Between 1995 and 2012, 450 adults and 169 children died in domestic fires while 10,000 adults and 6,000 children were made homeless (Table 6.5; Plate 6.6).

YEARS	FIRE RELATED DEATHS			FIRE RELATED INJURIES			HOMELESS		
	FF	AD.	CH.	FF	AD	CH	FF	AD	CH
1995	0	33	4	0	47	-	N/A	N/A	N/A
1996	0	49	-	0	47	-	‘	‘	‘
1997	0	23	8	0	5	34	‘	‘	‘
1998	0	23	10	0	-	-	‘	‘	‘
1999	0	13	9	10	140	12	‘	‘	‘
2000	0	17	5	6	37	12	‘	‘	‘
2001	0	21	12	13	11	1	‘	‘	‘
2002	0	11	14	23	67	2	‘	‘	‘
2003	0	17	12	7	128	1	‘	‘	‘
2004	0	28	4	8	89	74	‘	‘	‘
2005	0	26	8	8	95	11	0	1462	713
2006	0	26	18	30	57	12	0	1377	881
2007	0	35	6	24	50	11	1	1180	798
2008	0	34	10	23	81	18	1	1397	879
2009	0	33	19	16	52	25	0	1446	826
2010	0	34	12	15	56	2	0	1188	663
2011	0	9	11	15	34	10	0	1402	811
2012	0	23	11	13	68	3	-	1549	859
2013	0	14	5	17	44	9	-	1232	598
Jan – Aug 2014	0	14	6	27	33	2	-	983	464

Table 6.5: Compiled yearly fire statistics for Jamaica. Source: Fire Prevention Unit 2012. Key: FF – Fire Fighter, AD. – Adult, CH. – Children. N/A Not available. NB. Figures for 2014 are not available at the time of the report.

During 2013, fires resulted in the deaths of 19 persons (including five children), injury to 70 persons and caused 1,830 persons to be homeless (Table 8).

“The number of genuine fire calls in 2013 was 11,834 as reported by the Jamaica Fire Brigade, a 1.1 per cent decrease relative to 2012. The incidence of fires in most parishes, with the exception of St. Mary, Manchester and St. Catherine remained unchanged or reflected a decline. Most fires (2,697) were reported in St Catherine, which registered a 15.6 per cent increase, followed by Kingston and St Andrew (KSA), with 2,476 fires, 44 fewer than 2012. The data show that the largest number of fires was reported in parishes with high urban populations, namely St. Catherine, KSA, Clarendon and St. James” (PIOJ 2014, p. 3.15).

“Eighty-eight per cent of the fires were non-structural, with bush fires accounting for 66.0 per cent of those fires. Bush fires have been on an upward trend in recent years. Nonetheless, approximately 1,000 residential fires were reported across the island which caused damage to personal property while rendering 1,830

homeless. Most of these were in Kingston and St. Andrew which accounted for the highest percentage (34.5 per cent). About 600 children were among those rendered homeless. Overall, the number of persons rendered homeless declined by 24.0 per cent with the number of affected children declining by 34.4 per cent compared with 2012” (PIOJ 2014, p. 3.15).



Plate 6.6: Three bedroom house destroyed by fire in Riverton City, 6 persons were left homeless. Source: Loop Jamaica 2014³⁴.

It is important to note that landfill fires and resultant pollution are also dangerous to health as air and water quality are often compromised. This was evident in the 2012, 2013 and 2014 Riverton Landfill fires which affected the air quality of neighbouring communities in St. Catherine, and the KMA for several days.

Health related illnesses

As reported the small pox and cholera epidemic of 1852, the polio epidemics of 1953 and 1981; the past incidents of Yellow Fever, Malaria and Typhoid, coupled with Newcastle Disease (which decimated the chicken population of Jamaica in the early 1930's) all had significant impacts across Jamaica (NDP 1997). The number of Dengue cases reported at the end of 2012 was 4,670 (with 10 confirmed deaths) compared to 861 cases (with 4 confirmed deaths) in 2013³⁵. Diseases may also result as secondary hazards following a disaster. For example, immediately following the passage of Hurricane Gilbert a total of nine (9) typhoid incidents were reported (PAHO 1989).

Plant Diseases

Leaf Spot, Panama Disease, Rust, Citrus Greening, Black Sigatoka, Beet Armyworm and Lethal Yellowing, are reminders of some of the plant diseases that have and can still affect agricultural production in Jamaica (NDP 1997). More recently, in the last 10 years,

³⁴ <http://loopjamaica.com/2014/06/29/news-fire-destroys-three-bed-room-house-in-riverton-city/>

³⁵ http://www.paho.org/hq/index.php?option=com_docman&task=doc_download&gid=23999&Itemid=&lang=en

domestic onion and escallion production, and the citrus industry have suffered significant losses from the Beet Armyworm and Citrus Greening respectively.

The Beet Armyworm (*Spodoptera exigua*) pest has been associated with the impact of climate change based on higher temperatures and reduced precipitation, which supports the life cycle of the pest. This Beet Armyworm mainly attacks vegetable crops such as onion and escallion, in which “*the most recent outbreak, in May 2012, resulted in the destruction of some 45 hectares of crops valued at approximately \$31 million Jamaican dollars*” (Morris 2012, p. 2). In addition, Morris (2012) added that Southern St. Elizabeth which usually produces some 85 per cent of domestic onions, has experienced severe outbreaks of the pest species on escallion and onion fields over four consecutive years from 2009 to 2012. The Ministry of Agriculture and Fisheries approached the Food and Agriculture Organisation of the United Nations (FAO) in October 2012 and signed a two year project entitled “*Strengthening a National Beet Armyworm Programme*” valued at US\$213,000 to fight against this devastating pest (Morris 2012).

Similar support was given to the citrus industry since the advent of the citrus greening disease which resulted from an outbreak of the citrus Tristeza virus (CTV). Citrus production declined from 4 million boxes in 1999/2000 to less than 3 million boxes in 2012/2013 (JIS 2014). The recent collaboration between the Ministry of Agriculture and Fisheries, the Rural Agriculture Development Authority, FAO and the Citrus Protection Agency reduced the negative impact of citrus greening on the citrus industry (The Daily Gleaner 2013). Farmers reported significant successes through improvements in citrus production and quality of citrus groves (*ibid*).

Transportation accidents

Although Jamaica has experienced several marine, aircraft, railway and road transportation accidents, the Kendal train accident is significant based on the number of lives lost. The train derailment in Kendal, Manchester on September 1, 1957 resulted in the death of one hundred and eighty (180) persons and was the second worst rail accident in the world at the time (NDP 1997). Road transportation accidents claim the lives of hundreds yearly. Road accidents are quite frequent and accounted for 307 deaths in 2011, 319 deaths in 2010 and 347 deaths in 2009³⁶. In 2012 and 2013, 260 and 306 deaths were recorded respectively. The general trend is that approximately 80 per cent of these casualties on a yearly basis are males.

Although aeroplane accidents are rare in Jamaica, accidents related to a Boeing 737-823 in December 2009 and a small private plane (a six-seater TBM 900) in September 2014 are noticeable events. The Boeing 737-823 incident resulted from the aircraft being unable to stop thereby overrunning the runway at the Norman Manley International Airport. “*The aircraft broke through a fence, crossed above a road below the runway level and came to an abrupt stop on the sand dunes and rocks between the road and the waterline of the Caribbean Sea*” (JCAA 2009, p. 2). There was no post-crash fire or

³⁶ [http://www.nationalroadsafetyCouncil.org.jm/pdf/Crash per cent20Stats per cent20by per cent20Category per cent201992 per cent20- per cent202013.pdf](http://www.nationalroadsafetyCouncil.org.jm/pdf/Crash%20per%20cent20Stats%20per%20by%20Category%20per%201992%20-%20per%202013.pdf)

related deaths from the accident. Information surrounding the crash of the small aircraft is unclear at this time but it was confirmed that both occupants of the aircraft died. The aircraft went down off the northeastern coastline of Jamaica after the occupants apparently lost consciousness in United States airspace.

Industrial accidents

Industrial trucks carrying cargo such as petrol have also been involved in road accidents accompanied by explosions in some cases. The most recent event of this nature occurred on January 9, 2014 in the residential community of Mona Heights, St. Andrew. There was no explosion and no loss of life or significant damage reported from the event.

The Labour Ministry's 2013/14 annual performance report indicates that industrial accidents increased by 75 per cent, and that most were recorded in the third and fourth quarter of the fiscal year. In 2012/13, the ministry reported 219 accidents, and 383 in 2013/14 - a 74.9 per cent spike (Collinder 2014a). A total of 7 deaths were associated with the accidents reported, 4 more than the previous year. The increase in the number of incidents in 2013/14 is also related to the Occupational Safety and Health (OSH) Department having a broader mandate to investigate incidents (Collinder 2014a).

Civil Unrest

Civil unrest has also resulted in deaths and injuries. The May 2010 unrest in West Kingston resulted in some one hundred and eighty (180) persons being treated for moderate to severe injuries and another seventy-two (72) persons treated for minor injuries. The death toll ranged between seventy-six (76) to ninety (90) including two (2) members of the security forces (ECLAC 2010).

6.2. HAZARDS/THREATS

6.2.1 NATURAL HAZARDS/THREATS

Jamaica, by virtue of its location in the Caribbean Basin, its topography and geology is exposed to several hazards (Table 6.6). The most damaging and recurring hazards include tropical cyclones, floods, landslides and droughts. These hazards have had significant impact on economic activities, property values, human welfare and natural resources in Jamaica (PIOJ 2012; PIOJ 2014). It is expected that climate change will exacerbate the effects of climate-related and health hazards.

	Type of Hazard	Potential Climate Change Related Influence on Existing Hazards
Natural	<ul style="list-style-type: none"> ▪ Geological hazards: including earthquakes, seismic related geophysical processes, such as mass movements, landslides, rockslides and surface collapses, debris or mud slides, and tsunamis. Hydro-meteorological factors are important contributors to some of these processes. ▪ Hydro-meteorological hazards: including tropical cyclones (also known as typhoons and hurricanes), thunderstorms, hailstorms, coastal storm surges, floods including flash floods, heat waves, drought, El Niño Southern Oscillation (ENSO) and La Niña. 	<ul style="list-style-type: none"> ▪ Increase strength and/or frequency of Hydro-meteorological hazards: including tropical cyclones (hurricanes), thunderstorms, hailstorms, coastal storm surges, floods including flash floods, heat waves, drought, El Niño Southern Oscillation (ENSO) and La Niña ▪ Increase in temperatures, variable rainfall and prolonged drought
Anthropogenic/ Man-made	<ul style="list-style-type: none"> ▪ Socio-natural hazards: High population density in urban areas with inadequate basic-service provision (water, electricity, health, education, transportation) e.g. Maryland, Cassia Park and August Town where informal settlements are located; deforestation. ▪ Technological hazards: Pollution, fires, explosions, toxic spills, mining extraction in highly sensitive environmental areas, among others. ▪ Pollution from garbage disposal ▪ Biohazards, radiological hazards, etc. ▪ Armed conflict, civil unrest and related consequences, especially internal displacement and migrations. 	<ul style="list-style-type: none"> ▪ Lack of water for domestic purposes due to drought ▪ Increase in urban density ▪ Civil unrest or internal conflict over basic amenities ▪ Increase in squatting leading to the development of more informal settlements
Emergencies affecting Public Health and Safety	<ul style="list-style-type: none"> ▪ Illnesses and epidemics of major occurrence. Examples include: Chikungunya, Ebola, Avian flu, Dengue Fever, Malaria. ▪ Phytosanitary emergencies. ▪ Heat waves ▪ Respiratory illness triggered by fires, chemical spills and other events. 	<ul style="list-style-type: none"> ▪ Increased occurrence of epidemics such as Dengue fever and Malaria ▪ Contamination of water supplies ▪ Introduction of non-endemic diseases to Jamaica ▪ Heatstroke (especially elderly)
Trans-boundary and Regional Hazards	<ul style="list-style-type: none"> ▪ Sea level rise, endemic diseases, infectious diseases, terrorism, hazardous waste (e.g. lead acid batteries and chemicals), oil spills, invasive species and mass movement of refugees. 	<ul style="list-style-type: none"> ▪ Increase in sea level rise, endemic diseases, invasive species and mass movement of refugees. ▪ Introduction of non-endemic diseases to Jamaica

Table 6.6: Hazards that have and/or can affect Jamaica. Source: Edited from DIPECHO 2012.

Tropical storms and hurricanes

Tropical storms and hurricanes have the potential to affect the entire island, as exemplified by Hurricanes Gilbert (1988), Ivan (2004), Sandy (2012) and tropical storm Nicole (2010). Coastal areas are more vulnerable to tropical cyclones passing over or near the shore and are subject to high winds and storm surges (Map 6.3). The hilly interior of the island receives high wind speeds based on the topography and wind potential in those areas. These cyclones are formed throughout the hurricane season which extends from June 1 to November 30 each year in which more than one storm could affect the island. During the 2013 and 2014 hurricane seasons, Jamaica was not affected by any tropical storm or hurricane.

With more intense storms being forecast, key sectors and/resources include but not limited to water quality and availability, energy supply distribution, tourism, agriculture and food security, health, fisheries, coastal infrastructure and settlements, community livelihoods and development within urban and rural areas will continue to be adversely affected, with a likely increase in cost of damage.

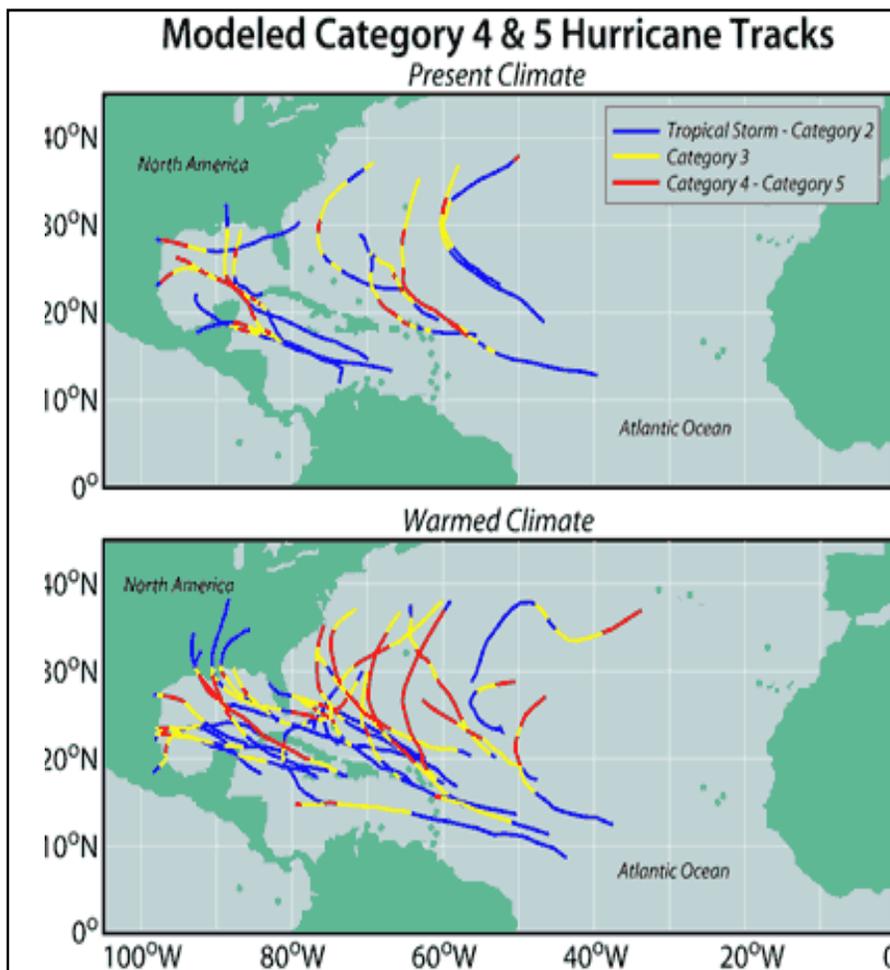


Figure 6.3: Simulated current and future Category 3-5 storms based on downscaling of an ensemble mean of 18 global climate change models. The figure shows nearly a doubling of the frequency of category 4 and 5 storms by the end of the 21st century, despite a decrease in the overall frequency of tropical cyclones. Source: Bender et al. 2010.

Earthquake

Jamaica is traversed by major faults which are often associated with seismic activity across the island. Its position on the northern Caribbean Plate Boundary Zone increases its exposure to earthquakes. The strongest earthquake in the country's recorded history was the 1692 event which destroyed Port Royal and parts of Kingston (Smith 2007). Earthquakes can affect the entire island but most of the earthquakes recorded have occurred in the eastern section of the island. Coastal areas and plains across Jamaica are at greater risk of higher intensities based on the sub-surface alluvium which amplifies earthquake waves and can lead to liquefaction if saturated.

Figure 6.4 highlights the seismic hazard contour maps developed for Jamaica in terms of peak ground acceleration (PGA) with 10 per cent probability of exceedence in 50 years (RP = 475 years), spectral ordinates (SA) at 0.2 and 1.0 s with 2 per cent and 1 per cent probability of exceedence in 50 years (RP = 2,475 and 4,975 years). *“The coefficient of variation (COV) decreases substantially for the SA of 0.2 s varies from 0.08 to 0.20, with the higher values near the area with the highest hazard level to the east of the island”* (Salazar, Brown and Mannette 2013, p. 1131). Based on the model result, the eastern section of the island is susceptible to higher peak ground acceleration. As results from research on seismic threats become available, relevant national standards should be adjusted/updated to reduce the associated risk.

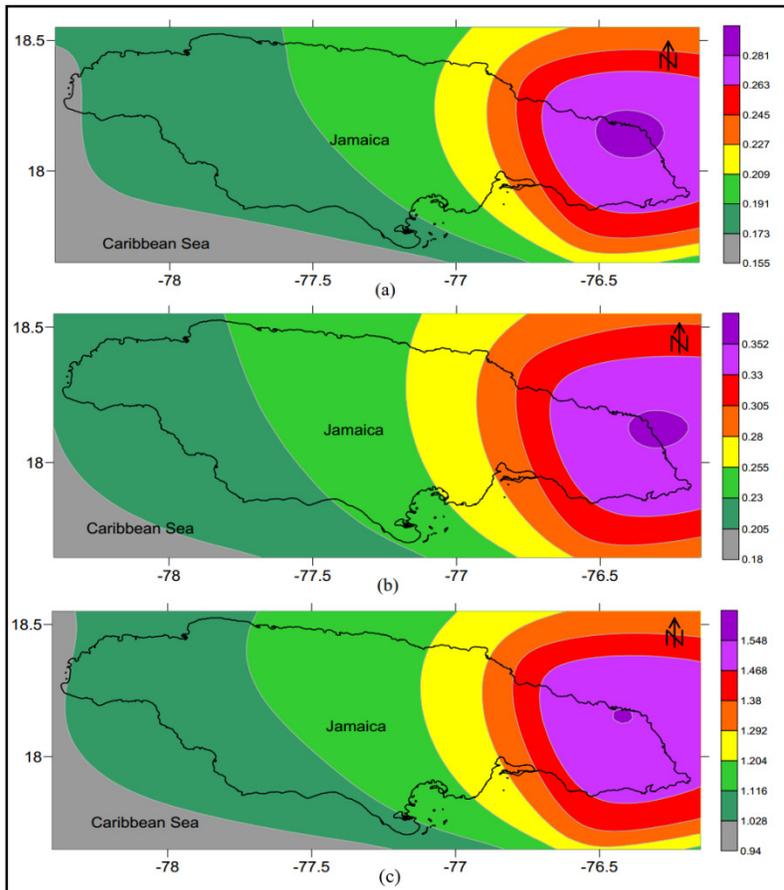


Figure 6.4: The seismic hazard contour maps: (a) seismic hazard map for the peak ground acceleration (g) and 475 years return period (b) seismic hazard map for spectral acceleration (g) at the period of 1.0 s and 2,475 years return period; (c) seismic hazard map for spectral acceleration (g) at the period of 0.2 s and 4,975 years return period (*their uncertainties are not presented*). Source: Salazar, Brown and Mannette 2013.

Flooding resulting from heavy rainfall

Although floods are usually localised, they can affect a number of communities along the course of the river channel or within limestone depressions (Figure 6.5). Flooding in Jamaica is usually caused from heavy rainfall events (May - June and September - October) or tropical cyclones (June - November) and surface flow exceeding their capacity of underground channels. “Between 2007 and 2010 there were 242 flood events recorded across the island” (PIOJ 2012, p. 93). To highlight Jamaica’s vulnerability to the flood hazard, all parishes have been and can be affected by flood events.

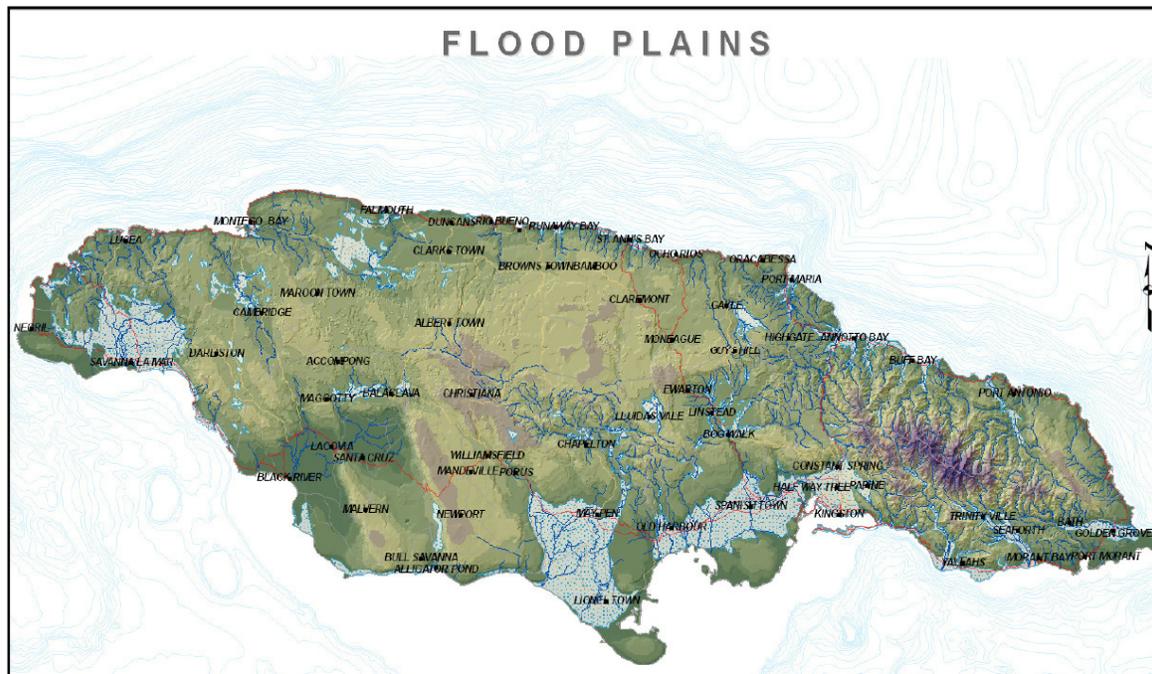


Figure 6.5: Flood prone areas of Jamaica. Source: Smith 2007.

Drought

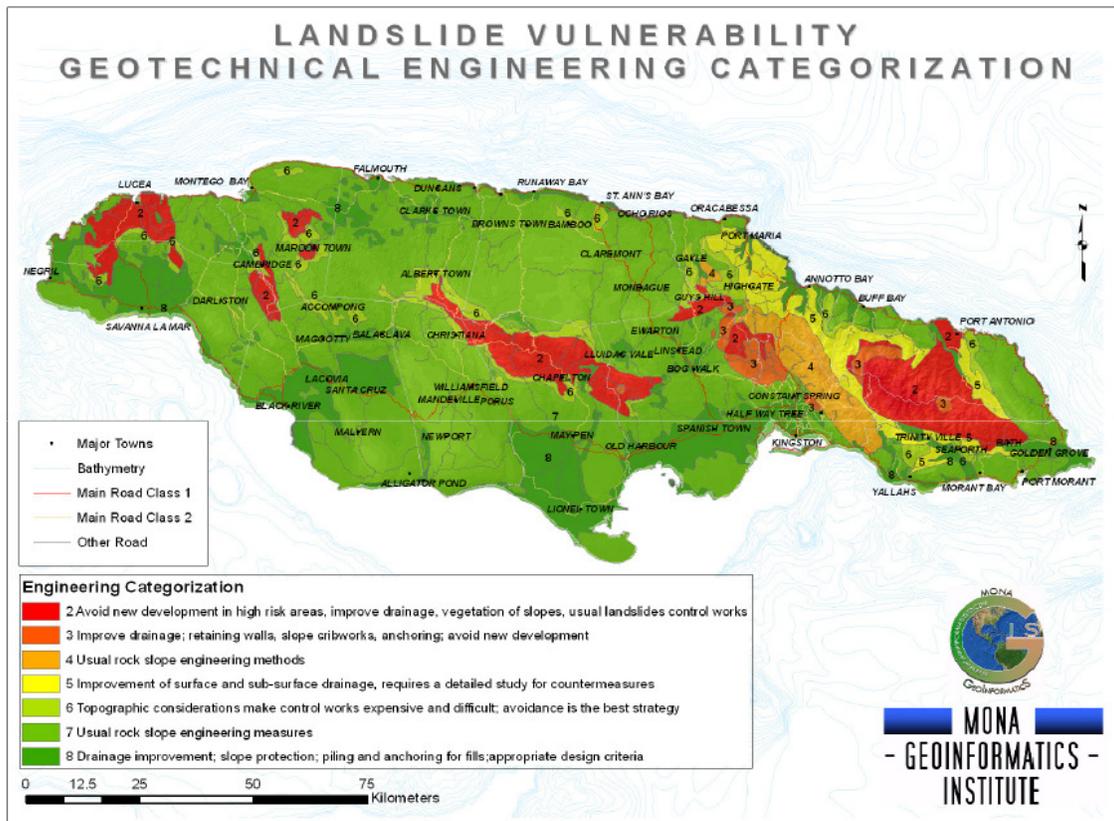
Droughts are considered slow-onset hazards developing over a period of time but have the potential to affect several parishes in varying ways based on water availability. Droughts normally stem from extensive periods of dry conditions which occur over the months of December to April, July and August.

Since the 2009-2010 drought, Jamaica has experienced successive droughts in some parishes on an annual basis. Most of the affected areas are usually located in south-western and south-central parishes which are main contributors to the domestic and export crop production. (See Section 6.1 for more information on drought).

Landslides

Landslides are usually localised in hilly or mountainous areas (Map 6.6) with higher susceptibility and can occur based on any of two natural trigger mechanisms. Intense or prolonged rainfall as well as earth movements such as earthquakes can trigger landslides. Landslides may also occur as a result of slope loading, weathered rocks, steep slopes,

clearing of land and the cutting of slopes for development purposes. The PIOJ reports that “(between 2007 and 2010 there were 44 landslide events recorded across the island” (PIOJ 2012, p. 93). It is important to note that landslides are considered to be the most frequently occurring hazard in Jamaica after floods (Smith 2007). The occurrences of flood and landslide events in most cases are associated with the same rainfall event.



Map 6.6: Landslide Vulnerability Map. Source: MGI 2012.

The risk associated with natural hazards can be partially managed with effective warning mechanisms. Floods, droughts, hurricanes and landslides (to a lesser extent) can be monitored before impact and their onset forecast. These warning mechanisms can be used for effective planning for evacuation and/or preparedness initiatives that are aimed at reducing disaster related loss of life and damage. Earthquakes still provide a great level of challenge to disaster managers as they provide little or no warning before impact.

6.2.2 ANTHROPOGENIC/MAN-MADE

Fires

Fires, accidents, explosions, toxic spills, pollution, deforestation, mining extraction in highly sensitive environmental areas, among others can be considered man-made hazards. Similar to other developing countries, Jamaica has urban and rural fire threats which may

result in property damage and loss of lives. Fires occur very frequently therefore the potential occurrence and impact of future fires should not be overlooked.

Transportation Accidents

Transportation accidents recorded in Jamaica are related to sea, rail, air and road of which the latter has occurred more frequently. Most road accidents are associated with the nature of road transport in Jamaica (NDP 1997), speeding and reckless driving. A total of 7,640 persons died because of road accidents over the period 1991-2011³⁷. The road networks in rural and mountainous areas are usually narrow which creates the potential for serious road accidents. For rail accidents, the threat has been significantly reduced, as there are no passenger railway systems now in operation. Although it is possible for rail accidents involving cargo to occur, the chances of such accidents occurring are low.

Industrial Accidents

Jamaica has been experiencing a steady increase in the number of industrial accidents (Collinder 2014a). Recent spills of noxious substances (2012, 2013 and 2014) and oil tanker fires (2012 and 2014) have highlighted the need for improved occupational safety and effective DRM in the workplace. The capacity of the Occupational Safety and Health (OSH) Department should be strengthened to implement new provisions under its mandate to investigate incidents and promote occupational safety. It should be noted that the potential exists for future accidents including but not limited to loss of lives, factory explosions and fires, the release of toxic fumes/gasses including land filling and equipment/structure collapse. As such, the necessary mitigation measures should be implemented by the relevant entities and organisations to reduce the impact of industrial accidents.

Socio-natural Hazards

Socio-natural hazards result from high density urban areas with inadequate basic-service provision (water, electricity, health, education, transportation). In Jamaica, these areas are referred to as ‘inner city communities’ which often times include the most vulnerable population. High levels of poverty also contribute to the living conditions of these persons based on their economic instability. In addition, unemployment rates are usually above the average contributing to the level of vulnerability that exists.

Civil Unrest

There have been several incidents of civil unrest, some of the largest of which have been the 1999 gas riots triggered by an increase in gas prices, and the 2010 incident in Tivoli Gardens triggered by an extradition order for a resident of the community. Small protests related to inadequate services such as a lack of piped water and bad road conditions are frequent though localised.

³⁷ <http://www.nationalroadsafetycouncil.org.jm/statistics/reports/docs/pdf/CrashStats1991-2011.pdf>

Cybercrime

Cybercrime activities have been recognized globally and can be seen as an emerging threat to developing countries to which Jamaica is no exception. Over the past decade, there has been an increase in the importance of internet/online platform for the storage and use of information of varying nature. Although global trends in cybercrimes indicate that the financial sector is the sector most targeted by cyber criminals (GOJ 2014), the potential impact on other sectors should not be overlooked. Jamaica's move towards e-government increases the potential for disruption of government services as computer servers and software can become compromised.

In Jamaica, the emerging trend indicates an increase in the number of cyber incidents. Figure 6.6 below shows cybercrimes for the years 2011 and 2012, while Figure 6.7 reflects cyber activities reported to the police for the years 2011 and 2012 but which are not offences under the Cybercrimes Act. Activities such as attacks against computer data and systems, damage to networks, identity theft, the penetration of online financial services, deployment of viruses, as well as botnets and various email scams such as phishing are becoming more common. However, inadequate reporting of cybercrimes hinders data collection on activities being conducted by cyber criminals (GOJ 2014).

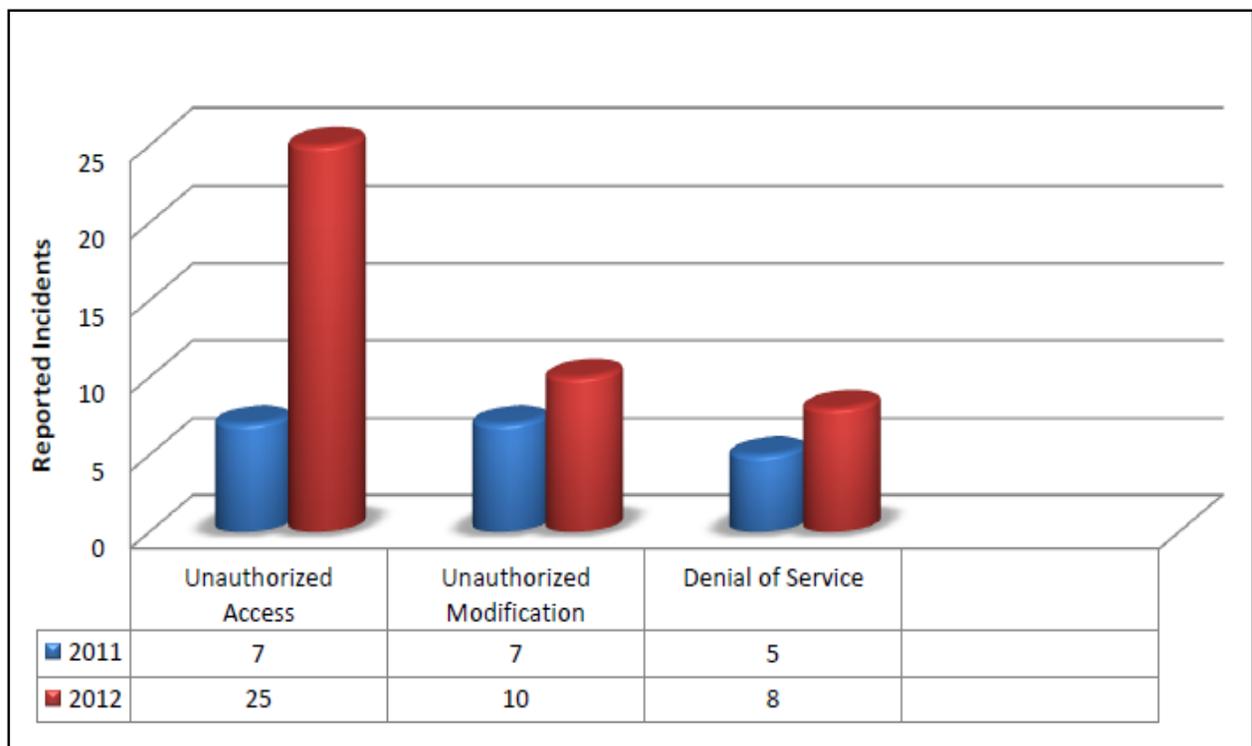


Figure 6.6: Reported cybercrimes (2011 and 2012). Source: GOJ 2014.

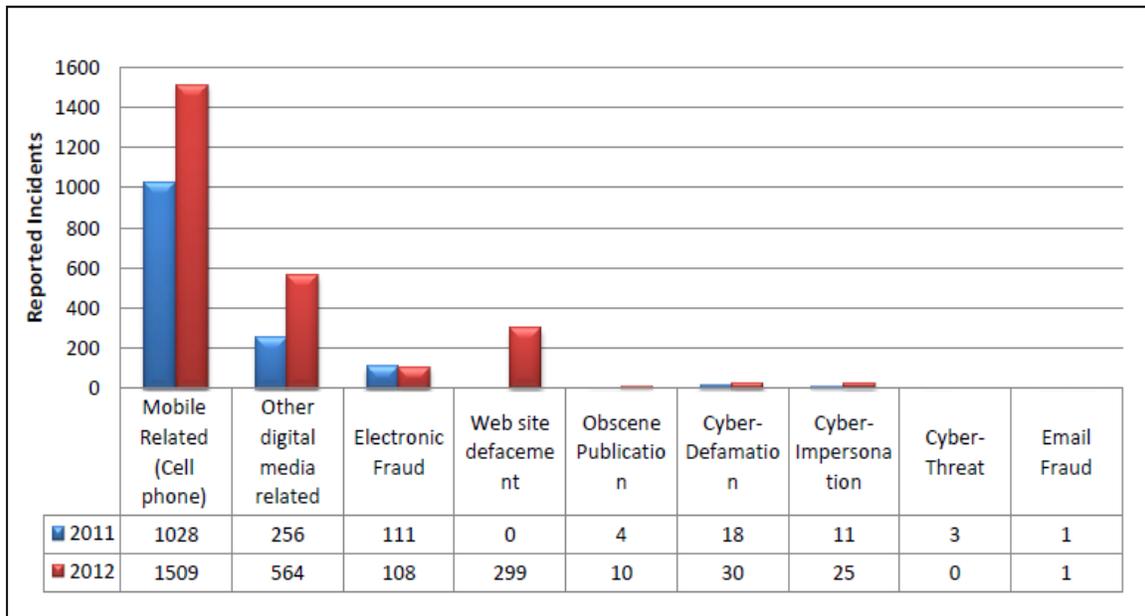


Figure 6.7: Cyber activities reported (2011 and 2012) but which are not offences under the Cybercrimes Act. Source: GOJ 2014.

The *National Cyber Security Strategy* (draft) recognizes that Information and Communications Technology (ICT) is a necessary tool for national development, as such, associated risks must be mitigated (GOJ 2014). It also highlights the potential impact of cybercrimes on national security and the potential to erode confidence and trust in the economy. This Strategy seeks to establish a framework that will be grounded in several key areas: (1) technical measures, (2) human resource and capacity building, (3) legal and regulatory, and (4) public education and awareness. The Ministry with responsibility for ICT will lead the implementation of the Strategy. Once adopted the identification activities to be implemented and allocation of responsibilities to specific entities for execution will be carried out.

The National Cyber Security Strategy will complement the National Information and Communications Technology Strategy 2007-2012; Jamaica's National Development Plan (*Vision 2030 Jamaica*); the Information and Communications Technology Policy 2011, and the National Security Policy 2012. It is important to note that *Vision 2030 Jamaica* has as one of its outcomes a technology enabled society where ICT, as a sector and an enabler of other sectors, is utilised to drive productivity and efficiency and unleash the creative potential of Jamaicans.

The nature of cybercrime makes it a new paradigm for law enforcement agencies (GOJ 2014). There are existing deficiencies relating to Jamaica's capacity, processes and technology to properly investigate and, prosecute these crimes. The trans-border nature of cybercrime requires international cooperation to assist in prosecution, mitigation and prevention efforts. Jamaica has established a Cyber Incident Response Team (CIRT) and the National Cyber Security Task Force (NCTF) to facilitate cooperation.

In addition, the Cybercrimes Act (2014) is currently being revised to increase “*the penalties for the offences under the Act, as well as, the criminalization of actions prejudicing investigations and activities such as computer related fraud, forgery and malicious communication. Additionally, provision will be made for the forfeiture of computer material which is the subject matter of an offence*” (GOJ 2014, p. 11). Effort is also being made to strengthen the capacity of law enforcement officers and prosecutors within the Communication Forensics and Cybercrime Unit (CFCU) of the Jamaica Constabulary Force (JCF) and the Digital Evidence and Cybercrimes Unit in the Office of the Director of Public Prosecution (ODPP).

6.2.3 EMERGENCIES AFFECTING PUBLIC HEALTH AND SAFETY

The current distribution of the majority of the population in urban areas across Jamaica could influence increased impacts from epidemics such as Malaria, Dengue and emerging health related threats such as Chikungunya and Ebola. The densely populated towns usually increase the possibility of transmission for these epidemics. Public health and safety can also be affected as a result of hurricane, earthquake, tsunami, drought and other hazards as diseases can develop during and after events.

Emerging hazards such as heat waves, expected to increase with a warmer climate, will differentially affect the elderly population and children under 3 years of age. Some vector borne diseases are also likely to increase with projected increase in temperature from a warmer climate. Decrease in water availability due to drought and variable rainfall may increase the occurrence of hygiene-related illnesses.

Chikungunya Virus

The mosquito-borne disease, Chikungunya virus (CHIKV), is an emerging threat to public health in Jamaica and the wider Caribbean (Table 6.7). In Jamaica, the disease is transmitted by the *Aedes Aegypti* mosquito, the same species involved in the transmission of dengue (PAHO 2012). The most common symptoms of CHIKV are fever and severe joint pains, often in the hands, wrist and ankles followed by other symptoms which include headache, backache, muscle pain, nausea, fatigue and rash. Since 2004, CHIKV has expanded its geographical range, causing an increase in the number of cases across the region. This has heightened the world’s public health awareness and concern about this virus (PAHO 2011; PAHO 2012).

CHICKV impacted Jamaica for the first time in 2014. The lack of immunity in the population resulted in high infection rates. Impact on the productive sector is severe, though not yet fully quantified, as workers are not able to report for duty. The number of confirmed cases does not reflect the level of incidence in the country as many persons do not seek medical attention. There have been media-reported deaths of children, the elderly and persons with underlying medical problems resulting from CHIKV related complications. The national response mechanism was activated as the outbreak was

eventually declared as a national emergency by the Prime Minister, as Chair of the NDC, and clean-up campaigns were started. (Plate 6.7).



Plate 6.7: A woman cleans a drain in Spanish Town, St Catherine (L) and St. Elizabeth residents participating in clean-up activities (R). Source: The Jamaica Observer 2014.

Country/Territory	Week	Autochthonous transmission cases		Imported cases (confirmed)	Incidence Rate	Deaths	Population X 1000
		Suspected	Confirmed				
Latin Caribbean							
Cuba	Week 42			20	0.0	0	11,266
Dominican Republic	Week 38	486,306	84		4,675.0	6	10,404
French Guiana	Week 42	5,910	3,753		3,880.7	0	249
Guadeloupe	Week 42	80,370	430		17,339.1	65	466
Haiti	Week 28	64,695	14		627.2	0	10,317
Martinique	Week 42	68,340	1,515		53,734.6	74	404
Puerto Rico	Week 39	14,587	3,145	30	480.8	4	3,688
Saint Barthelemy	Week 42	1,060	142		13,505.6	0	9
Saint Martin (French)	Week 42	4,330	793		14,354.2	3	36
<i>Subtotal</i>		725,598	9,876	50	1,996.5	152	36,839
Non-Latin Caribbean							
Anguilla	Week 42		45	2	281.3	0	16
Antigua and Barbuda	Week 38	1,249	18		1,407.8	0	90
Aruba	Week 43	146	26	12	157.8	0	109
Bahamas	Week 37		79	4	21.0	0	377
Barbados	Week 42	537	49	8	202.8	0	289
Cayman Islands	Week 42		25	3	46.3	0	54
Curacao	Week 35	607	58	7	452.4	0	147
Dominica	Week 41	3,745	171		5,364.4	0	73
Grenada	Week 41	2,826	26		2,592.7	0	110
Guyana	Week 31		76		9.5	0	800
Jamaica	Week 42	709	67	2	27.9	0	2,784
Montserrat	Week 42	2	11		260.0	0	5
Saint Kitts and Nevis	Week 21	31	28		115.7	0	51
Saint Lucia	Week 35	214	120		204.9	0	163
Saint Vincent and the Grenadines	Week 42	329	165		479.6	0	103
Saint Maarten (Dutch)	Week 39		402		1,005.0	0	40
Suriname	Week 39		836	14	155.1	1	539
Trinidad and Tobago	Week 38		93	3	6.9	0	1,341
Turks and Caicos Islands	Week 28		10	7	20.8	0	48
Virgin Islands (UK)	Week 41		44		137.5	0	32
Virgin Islands (US)	Week 41	993	76	2	1,018.1	0	105
<i>Subtotal</i>		11,388	2,425	64	189.8	1	7,276

Total		736,986	12,301	114	1093.15	153	54,557.5
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Table 6.7: Number of Reported Cases of Chikungunya in the Caribbean 2013-2014 (Epidemiological Week 44 – Updated October 31, 2014). Source: Edited from PAHO 2014.

The Ebola Virus Disease (EVD), formerly known as Ebola Haemorrhagic Fever, is a severe illness in humans and can be fatal without proper treatment and care (WHO/ILO 2014). The Ebola virus can be transmitted by direct and indirect contact with bodily fluids of an infected animal or person. In Table 6.8, a total of 9216 confirmed, probable, and suspected cases of Ebola with 4,555 deaths have been reported in seven affected countries (Guinea, Liberia, Nigeria, Senegal, Sierra Leone, Spain, and the United States of America) up to the end of October 14, 2014 (WHO 2014).

Country	Case definition	Cumulative Cases	Cumulative Deaths
Guinea	Confirmed	1647	958
	Probable	208	208
	Suspected	64	0
	All	1919	1166
Liberia	Confirmed	2562	0
	Probable	1716	0
	Suspected	2600	0
	All	6878	2812
Sierra Leone	Confirmed	4683	978
	Probable	79	174
	Suspected	824	35
	All	5586	1187
United States of America	Confirmed	4	1
	Probable	0	0
	Suspected	0	0
	All	4	1
Spain	Confirmed	1	0
	Probable	0	0
	Suspected	0	0
	All	1	0
Mali	Confirmed	3	3
	Probable	1	0
	Suspected	0	0
	All	4	3

Table 6.8: Number of Reported Cases of Ebola (Updated November 14, 2014). Source: Edited from WHO 2014.

Jamaica has developed a Comprehensive Ebola National Response and Action Plan led by the Ministry of Health and the Jamaica Defence Force (JDF), with emphasis on training, sensitisation, simulations and public communication. The country also instituted an entry ban for persons travelling from Ebola affected countries in Africa. Similar bans

have been implemented by other Caribbean states such as Trinidad and Tobago, Antigua and Belize in order to protect their borders.

To date, there has been no confirmed case of Ebola in Jamaica, but recent events involving a Nigerian doctor and a citizen of the United States of America highlighted the need for effective screening and management of potential Ebola cases. In reacting to the situation at hand, the government has established a Quarantine and Medical Post at the Norman Manley International Airport and issued digital thermometers to Customs Officers at both international airports (Plate 6.8). Training will also be provided to first responders and health practitioners.



Plate 6.8: Health Minister Dr. Fenton Ferguson at the medical post at the Norman Manley International Airport (L)³⁸; and Dr. Marion Bullock-DuCasse (Director of Emergency, Disaster Management and Special Services in the Ministry of Health) demonstrating the use of handheld temperature scanning machines at the airport (R)³⁹. Source: The Daily Gleaner 2014.

Food Security

The *Jamaica National Food and Nutrition Security Policy* seeks to encourage government policy that can improve food availability based on macroeconomic stability and competitive markets (GOJ 2012). Food security is essential in providing access to food of good quality and to ensure that nutritional requirements are fulfilled, especially among children and the elderly. This is essential in eliminating all forms of malnutrition in order to have a well-nourished and healthy population that can contribute effectively to national economic development (GOJ 2012). The policy will also address underlying vulnerabilities of food security such as climate related/natural hazards, lack of good agricultural practices, plant disease and restriction on trade.

³⁸ <http://jamaica-gleaner.com/gleaner/20141019/lead/lead2.html>

³⁹ <http://jamaica-gleaner.com/gleaner/20141018/lead/images/HandheldLaserA20141017RB.jpg>

6.2.4 TRANSBOUNDARY, REGIONAL AND GLOBAL HAZARDS

Transboundary and regional hazards in the Caribbean include but are not limited to the movement and dumping of hazardous waste (e.g. lead acid batteries and chemicals), oil spills, hurricanes, tsunamis, volcanic eruptions, climate related risks, infectious diseases, invasive species, cybercrimes (see Section 6.2.2) and mass movement of refugees. Transboundary hazards as used here, refers to those hazards which originate outside Jamaica, but which can affect the island. The potential exists for transboundary threats to health through communicable diseases as well as hazardous materials events arising from trans-Caribbean traffic. Transboundary and regional hazards also have the potential to affect national development through related impacts on key economic sectors.

Climate Change is a global phenomenon that is expected to affect temperature, rainfall patterns, dry periods and the intensity of hurricanes across the globe. A number of future scenarios for 2030 - 2040, 2050 - 2060 and 2070 - 2080 have been created for the Caribbean to increase climate change awareness and guide development planning. These scenarios are usually created using temperature and rainfall patterns on which drought, floods, sea level rise and hurricane projections are dependent. *“For the next two decades, a warming trend of about 0.2⁰C is projected for a range of greenhouse gas (GHG) emission scenarios. As a consequence, it is anticipated that sea levels and global sea surface temperature will increase; weather patterns will change resulting in an increase in the frequency and intensity of extreme weather events, such as droughts, floods, and possibly hurricanes”* (CCCCC 2009, p. iii). Figures 6.8 & 6.9 highlight the related impacts of the A2 and B2 scenarios on the temperature and rainfall projections for Jamaica in the year 2080.

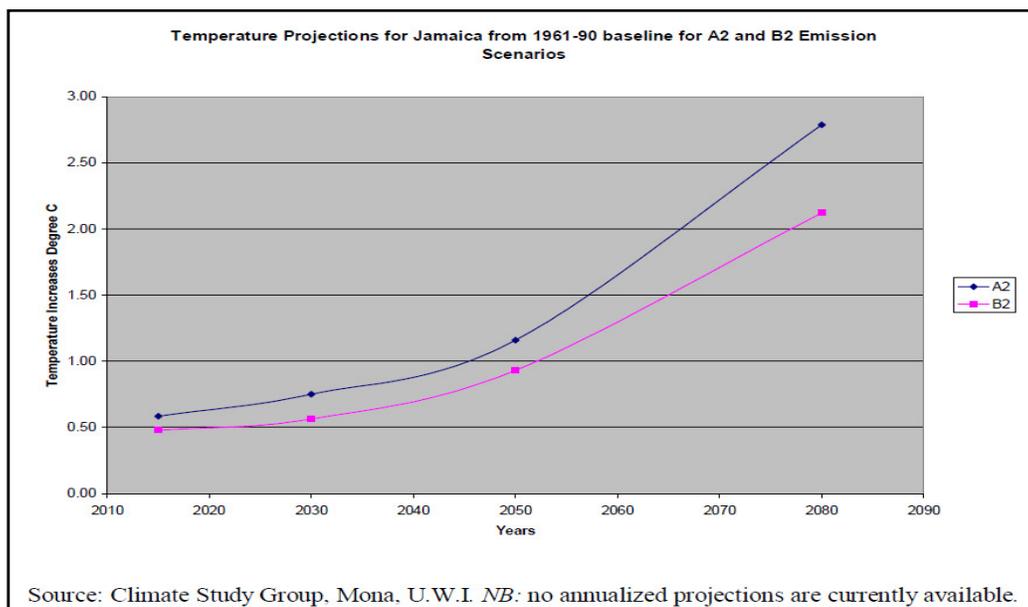


Figure 6.8: Temperature projections for Jamaica from 1961- 90 baseline for A2 and B2 emission scenarios. Source: SOJC 2013.

Changes in the climate of Jamaica are projected to result in increased temperatures (min, max and range), variable rainfall (increase or decrease over particular seasons), more intense hurricanes, prolonged drought, sea level rise as well as an increase in the incidence of pests and diseases. Increased prevalence of non-endemic illnesses in the Caribbean might exist due to changes in local and regional climate (SOJC 2013).

“Considering all models and scenarios, the Caribbean as a region is expected to warm by between 1.4 and 3.2 degrees by the end of the current century. In comparison for Jamaica, projected mean annual temperature increase across all models in the 15 Global Climate Models (GCM) ensemble and across all scenarios is 1.1 to 3.2 degrees by the 2090s” (SOJC 2013, p. 6-3). It is important to note that all predictions have a level of uncertainty that should be considered when discussing future climates. Similarly *“GCM projections of future rainfall for the Caribbean span overall increases and decrease, but most models project decreases, especially by the end of the century (-39 per cent to +11 per cent). The projections of rainfall extreme are mixed across the ensemble, ranging across both decreases and increases in all measures of extreme rainfall”* (SOJC 2013, p. 6-2).

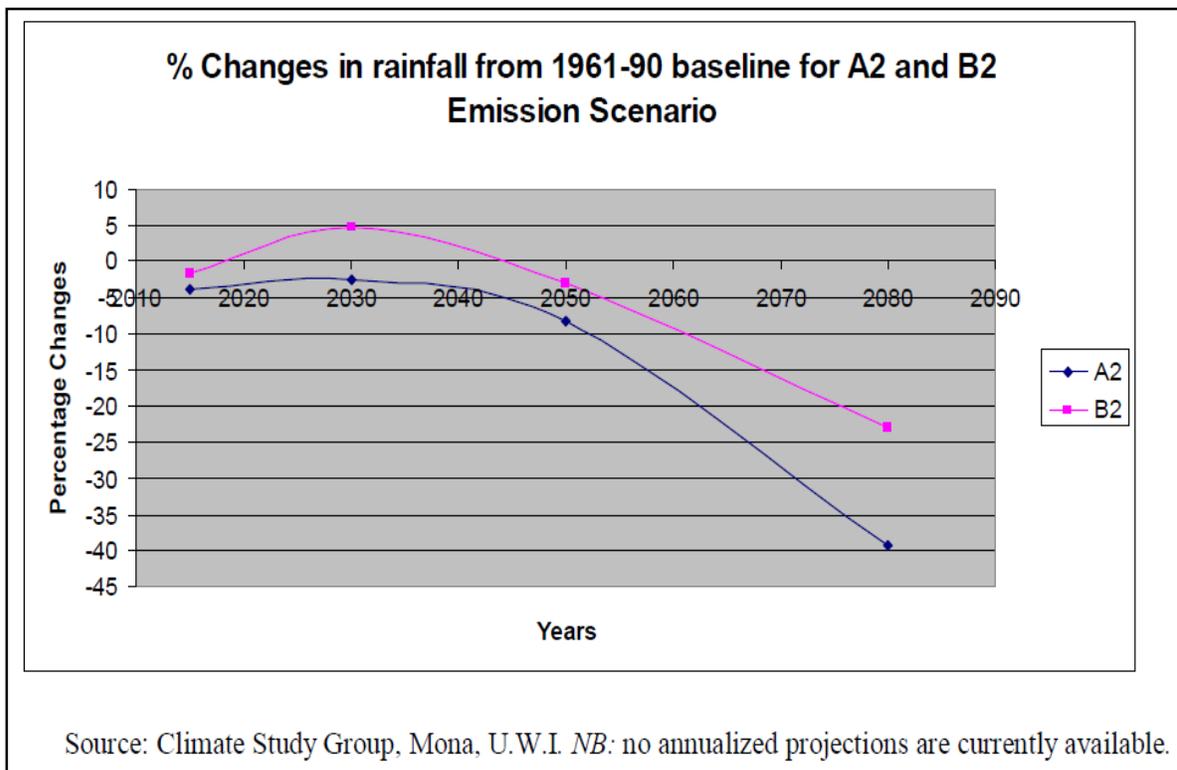


Figure 6.9: Percentage changes in rainfall from 1961- 90 baseline for A2 and B2 emission scenarios. Source: SOJC 2013.

Climate variability usually refers to average weather behaviour over a period of time which may include month(s), season(s) or year(s). When climate values deviate from the mean it results in anomalies which are considered over short periods as variability and

over long periods as trends (SOJC 2013). Climate variability for Jamaica and the Caribbean at large is dependent on specific drivers. These drivers include but are not limited to the El Niño/La Niña, sea surface temperatures, the North Atlantic Oscillation (NAO), Atlantic Multidecadal Oscillation (AMO) and the Caribbean Low Level Jet (CLLJ). However, climate variability and trend calculations in Jamaica are often affected by lack of available data (SOJC 2013).

There is evidence from several models to suggest that there has been a 0.1 degrees Celsius/decade change in the temperature based on data collected from the two international airports from 1992 to 2010 (SOJC 2013). However, this is less than the value (0.27 degrees Celsius/decade) recorded for the island. It is important to note that the “annual and seasonal rate of temperature increase ranges from 0.20 – 0.31 Degrees Celsius/decade” (SOJC 2013, p. 4-7). The mean rainfall trend of Jamaica has experienced minute change in values. However, “there are small percentage decreases in the annual rainfall and summer rainfall per decade. The decrease in the June – August period is the strongest. A small increasing rainfall trend is evident for the drier seasons of the year (December – May)” (SOJC 2013, p. 4-11). In addition, most of the reduction in rainfall has occurred over eastern and western parishes (Figure 6.10).

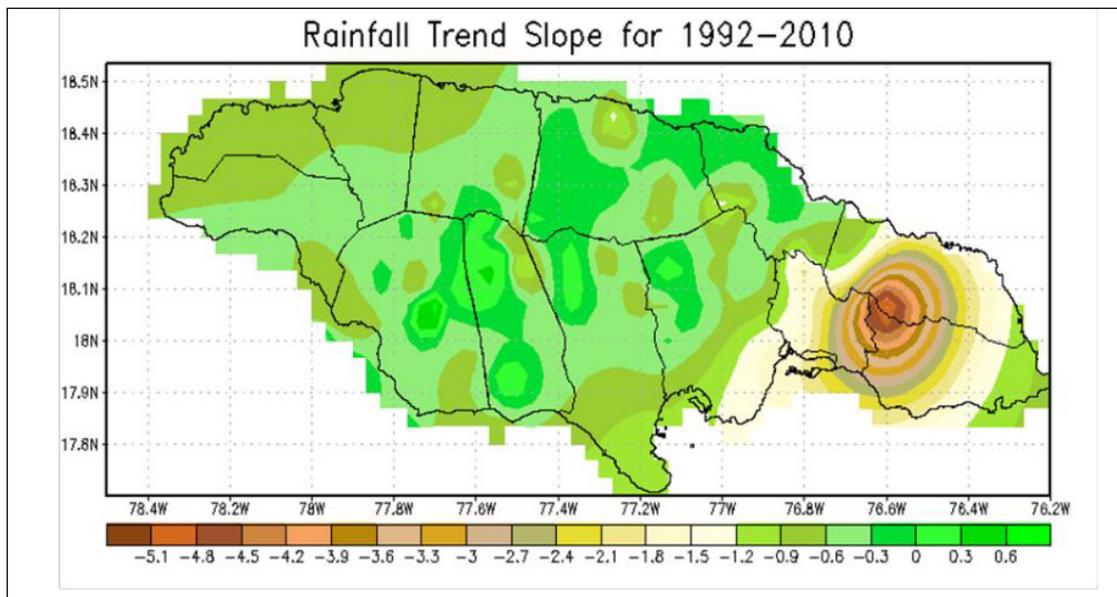


Figure 6.10: Rainfall trend slope. Positive slope suggest increasing rainfall, and negative slope suggest decreasing rainfall. Data Source: Meteorological Service of Jamaica. Source: SOJC 2013.

Although the impacts relating to hydro-meteorological hazards are projected to increase, enough evidence is not available to scientists to confirm that the frequency of hydro-meteorological hazards will increase. There has been a significant increase in the tropical cyclone activity in the Caribbean and wider North Atlantic since 1995, however, the link between warmer sea surface temperatures and the increase in the number of storms/hurricanes is inconclusive (SOJC 2013). It is important to note that while a change

in the frequency of occurrence of tropical cyclones is inconclusive, the number of intense storms (category 4 and 5) are projected to increase. However, in relating to the climate change stressors and enhanced impact, there is always a degree of uncertainty. The level of uncertainty is derived from the fact that the future cannot be predicted by one scenario based on the range of different parameters and situations that would have to be considered.

The tourism sector and development along coastal areas will be affected by sea level rise which is estimated to have been $0.17 \pm 0.05\text{m}$ over the 20th century globally, similar to that of the Caribbean (SOJC 2013). The advent of climate change will influence a gradual increase in sea level which will affect the low-lying coastal areas of most SIDS. Current predictions suggest that the rate of sea level rise will increase over the 21st century in which a maximum rise of 1.4m might be achieved (SOJC 2013). *“Two socio-economic scenarios were modelled; one without climate change variables (control scenario) and another with assumptions about a changed climate. An independent model was also developed to examine visitor arrivals over time. For the control scenario, visitor arrivals are expected to increase to 3.1 million by 2050. For the scenario with a changing climate, the number of visitors falls to 2.7 million by 2050, resulting in declines in earnings”* (GOJ 2011, p. 17).

6.3. VULNERABILITY

Vulnerability as defined within UNISDR terminology refers to “the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard” (UNISDR 2009). Vulnerability is multidimensional and can be reflected in various contexts; for example, physical, social, economic, and environmental. Poor design and construction of buildings, inadequate public awareness programs, limited recognition of risk, inadequate preparedness measures, and a general disregard for sound environmental management can all cause increased vulnerability to hazards.

As defined by the IPCC, vulnerability to climate change is the degree to which geophysical, biological and socio-economic systems are susceptible to, and unable to cope with, adverse impacts. It suggests that key vulnerabilities are associated with many climate-sensitive systems; including for example, food supply, infrastructure, health, water resources, coastal systems, ecosystems, and global biogeochemical cycles (IPCC 2007).

The *Human Development Report 2014* (UNDP 2014) takes a more holistic approach to vulnerability by examining the factors which contribute to increasing risks to human development and suggesting ways to strengthen resilience. The Report utilises what it calls ‘a life-cycle approach’ by assessing vulnerabilities over the course of a lifetime. From this it proposes that children, teenagers and the elderly all face different kinds of risks. The increase in human vulnerability worldwide is highlighted and ways to reduce risks discussed including strengthening societies’ social protection infrastructure.

In order to address vulnerabilities and build resilience the Report calls for:

1. universal access to basic social services, especially health and education;
2. stronger social protection, including unemployment insurance and pensions;
3. a commitment to full employment;
4. responsive and fair institutions and increased social cohesion for building community-level resilience and for reducing the potential for conflict to occur.

For Jamaica, a Small Island Developing State (SIDS), vulnerability is often seen as inherent in its geographic location, small size, insularity and remoteness (leading to high external transport costs) and economic factors e.g. small economy, dependence on natural resources, demography, limited human resource base among other issues (Pantin 1994). Coupled with these intrinsic problems is the impact of globalization and the attendant global pressures. Jamaica like other SIDS must practise DRR to protect lives, livelihoods, its fragile economy and to achieve sustainable development goals.

Adverse environmental impacts in Jamaica include a decline in the health of coral reefs, loss of sea-grass beds, severe beach erosion and loss of forested areas. A degraded environment exacerbates the impact of hazards. These impacts have also resulted in significant social dislocation and economic losses and damage from natural hazards (PIOJ 2012). According to the World Bank (2010), Jamaica has the second highest economic risk exposure to two or more hazards coupled with exposure of 96.3 per cent of the national population, 94.9 per cent of the national territory and 96.3 per cent of GDP to two or more hazards, including floods, tropical storms, hurricanes, landslides and earthquakes.

Disasters exacerbate inequity because they impact vulnerable groups the most, which can in turn exacerbate fragility and conflict (GFDRR 2012).

Other drivers of vulnerability in Jamaica have been identified as⁴⁰:

1. the country's debt burden;
2. health status;
3. vulnerable population- the disabled, children under 14 years, adults 65+;
4. inadequate enforcement of building code and zoning regulations;
5. land degradation;
6. unplanned urban growth in areas unsuitable for building/squatting;
7. inadequate infrastructure (e.g. poorly built roads);
8. poor governance;
9. lack of knowledge (risk and disaster information);
10. culture; and
11. geographic location and climate change.

According to Dasgupta et al. (2009) the impact of sea level rise and intensified storm surges in Latin America and the Caribbean will be highest in Jamaica. These authors

⁴⁰(GFDRR 2010; National Disaster Risk Reduction Workshop - Working Group 1, 2012)

note that potential losses of coastal GDP are projected to exceed 26.62 per cent of total GDP. Further, the inundation risk in Jamaica from storm surges will cover 36.55 per cent of the coastal wetlands (Dasgupta et al. 2009).

6.3.1 METHODOLOGIES

All methodologies have limitations, therefore tradeoffs are often unavoidable. A number of different methodologies have been used in Jamaica to assess vulnerability including; *Vulnerability Ranking Methodology* (VRM) used in the parish of Clarendon by ODPEM, *Risk and Vulnerability Assessment Methodology Development Project* (RiVAMP) used in Negril, the *Community Vulnerability Assessment Tool* (CVAT) adapted from the National Oceanic and Atmospheric Administration (NOAA) used in Black River, Ocho Rios and Savanna-la – mar, the *Caribbean Climate Online Risk and Adaptation Tool* (CCORAL) developed by CCCCC, and the *Guidance Tool* (G Tool) an online monitoring and evaluation tool developed by Caribbean Disaster Emergency Management Agency (CDEMA). Below is a brief synopsis of each.

6.3.1.1 THE VULNERABILITY RANKING METHODOLOGY (VRM)

The *Vulnerability Ranking Methodology* (VRM) developed by the ODPEM focusses on ranking vulnerable communities. It seeks to identify high risk communities with the aid of hazard maps and Geographic Information Systems (GIS) technology used to perform geo-spatial vulnerability analyses for hazard planning and mapping. The ranking assists ODPEM in deciding which communities should be prioritized for DRM programmes.

The goals of the VRM methodology are to:

1. develop a framework to support DRR based on a systematic and generic approach to the ranking of vulnerable communities;
2. support current vulnerability assessments and demonstrate the use of geo-spatial analyses;
3. allow for comprehensive and cohesive integration of measureable indicators at the local level into the broader national scope for DRR;
4. develop greater emphasis on mitigation measures that address community wide vulnerabilities;
5. assess the potential for long-term disaster impacts and provide a foundation for sustainable disaster preparedness, response and recovery.
6. equip communities with the tools for determining and ranking multi-hazard susceptibilities.

Results derived from the methodology (ODPEM, undated and A. Tucker, undated), will be used at the national level and community level to:

1. promote the development & prioritization of hazard mitigation strategies;
2. improve disaster response capabilities;
3. advance disaster recovery initiatives; and

4. enhance the enforcement of current land-use and hazard mitigation policies.

Analytical methods applied in the VRM:

1. Hazard identification: review internal hazard database.
2. Hazard analysis: evaluate ODPEM's list of areas of high risk, identify geographically defined risks areas.
3. Critical facilities analysis- how many there are and their proximity to the community.
4. Socio-Economic analysis: highlight areas of high risk versus areas with minimum resources to address disaster recovery needs.
5. Economic analysis: used to identify the main economic sectors in the community; and impact on the community's livelihood and how this in turn impacts the given sectors.
6. Environmental analysis: indicators to assess a community's vulnerability would be highlighted e.g. land use, types of ecosystems, etc.

In the VRM the seven vulnerability **indicators** used are:

1. **The Dependency Ratio** focusses on the community's dependent population that is, the elderly (those above 64 years) and children-14 years and under. The disabled are however, not independently captured. Here the population is vulnerable due to age, inability to access the necessary resources and often physical challenges.
2. **The Population Density** focusses on the number of persons occupying a given area in relation to size of the area. Population density is usually *calculated as the number of persons per sq. km.*
3. **The Poverty Index** focusses on the community's access to basic amenities (clean water, health services etc.), issues of malnutrition, and the poverty level of each community (informed by the UN's Poverty Index).
4. **Hazard Frequency** focusses on the frequency of hazard impacts within the community over 10 year period.
5. **Housing Type** focusses on materials used in construction of most of the houses in the community.
6. **Hazard Impact Area** focusses on the extent of impact area usually measured in average kilometers.
7. **Capacity to Respond** focusses on the ability of the community to respond to the needs of persons within it using its own resources following a disaster (ODPEM, undated).

Criteria and Weighting in the VRM

In the VRM weighted values are assigned to each indicator using a standard interval of 1 - 5. The higher the weighting applied (e.g. 5) the more vulnerable the community being measured and the lower the weighting (e.g. 2) the less vulnerable the community. A Vulnerability Score is applied to the matrix to calculate the total weighted values for the indicators. The scores are then ranked and the level of vulnerability is then determined.

6.3.1.2 THE RISK AND VULNERABILITY ASSESSMENT METHODOLOGY (RiVAMP) Project

Jamaica was selected for a project using this method this project because of the country's diverse ecosystems, rich biodiversity considered a tourist "hotspot", high economic dependence on ecosystems, development pressures on natural environment and exposure to sea level rise, storms and storm surges.

The methodology:

1. Analyses disaster risk while taking natural environment/ecosystems into account
2. Highlights ecosystem protection as 'no regrets' option as it is:
 - Cost effective
 - Relatively easy and fast installation (can be done with local population)
 - Low to moderate maintenance
 - Aesthetical and cultural value
 - Support biodiversity in providing food, livelihoods
 - Acts as a carbon storage
 - Assist with pollution control
 - *Emphasises* ecosystems goods and services
3. Approaches used for analyses are evidence based, scientific and qualitative
4. Targets SIDS and coastal areas
5. Focusses on climate related hazards and their secondary effects e.g. flooding, storm surge, sea level rise (Kelly and Roper 2012)

Description and Application of the RiVAMP Methodology

Stage I: Scoping

1. Scoping Mission by UNEP Team (Feb. 2009)
2. Introduce methodology to national level partners and get buy-in
3. PIOJ selected as implementing partner
4. Multi-sectoral Advisory and Technical Committees established
5. Coastal resources identified as being in a critical state
6. Selection of Negril as main study area in consultation with national partners

Stage II: Desk Study

1. Identified existing data, research conducted on the study area, gaps in existing data
2. Types of Data collected:

- Spatial (e.g., satellite imagery)
 - Quantitative (e.g., distance of beach retreat in km)
 - Qualitative (e.g., governance systems and issues)
3. PIOJ coordinated data collection, working with ministries, agencies, departments and UNEP

Stage III: Field Work

Consultations national, parish and community levels

1. Types of information collected from stakeholders
2. Knowledge on the types, roles, threats to, rate of change and state of ecosystems
3. Level of degradation observed
4. How livelihoods are linked to ecosystems
5. Local coping and adaptation strategies
6. Knowledge of/Perceptions of governance systems
7. Key issues and potential/proposed solutions

Stage IV: Analysis

1. Numerical Modelling
2. Multiple Regression Analyses
3. Tropical Cyclone Exposure Models
 - derives wind speed, storm surges (Note: landslide data was not available for inclusion in analysis)
 - based on 6m elevation model
 - exposure of population, assets assessed for 10- and 50-year return period storm events

Stage V: Outputs

1. Numerical Modelling
2. Multiple Regression Analyses
3. Coastal morpho-dynamic models
4. Tropical Cyclone Exposure Models

Stage VI: Evaluation Benefits:

1. Re-enforcement of existing knowledge that ecosystems are critical to DRR
2. Greater awareness of ecosystems goods and services in communities, through media
3. Capacity building of national and local groups: exposure to technologies, new tools for consultations
4. Data: high resolution satellite imagery, community maps, outputs of study area, stakeholder perceptions on ecosystem services, threats, drivers of degradation

Enabling factors:

1. Timeliness of RiVAMP (as ecosystems-based tool taking climate change into account).

2. Data availability (spatial, socio-economic, meteorological datasets; studies on erosion).

6.3.1.3 THE COMMUNITY VULNERABILITY ASSESSMENT TOOL (CVAT)

The National Oceanic and Atmospheric Administration (NOAA) developed the *Community Vulnerability Assessment Tool (CVAT)*. It involves an assessment of the physical, social, environmental and economic vulnerabilities of a selected area, and includes recommendations for mitigation measures for the area selected.

An important feature of the CVAT application in Jamaica is that the vulnerability assessment builds on previous work conducted in the Caribbean in response to disaster management planning and involving community participation. A study on risk assessments and the development of risk management plans was implemented in three (3) Jamaican communities - namely Black River, Ocho Rios and Savanna-La-Mar. The decision was taken to use the CVAT methodology since the study focussed on housing and critical facilities in the three towns. It was felt that the CVAT was systematic, relevant and appropriate to the needs of understanding vulnerabilities in these 3 locations. The methodology focusses on the types of hazards to be assessed, critical facilities in the communities, social vulnerability and environmental vulnerabilities (SWI 2011).

The steps for CVAT are outlined below:

Step 1: Identify Hazards and Establish relative priorities for these hazards

Step 2: Identify critical facilities categories and Complete critical facilities inventory
Identify intersections of critical facilities and high-risk areas and Conduct vulnerability assessment on all critical facilities

Step 3: Identify areas of special consideration

1. Identify intersections of special consideration areas and high-risk areas
2. Conduct a general inventory of special consideration/high-risk locations

Step 4: Identify primary economic sectors and locate economic centers

1. Identify intersections of economic centers and high risk areas
2. Conduct a general inventory of high-risk areas
3. Identify large employers and their intersection with hazard risk areas
4. Conduct vulnerability analysis on structures of large employers as critical facilities

Step 5: Identify secondary hazard risk consideration sites and key environmental resource sites

1. Identify intersections of secondary risk sites, environmentally sensitive areas and natural hazard risk consideration areas

2. Identify key environmental resource locations and their proximity to secondary sites
3. Conduct vulnerability analysis on priority secondary risk sites as critical facilities

Step 6: Identify areas of undeveloped land and their intersection with high-risk areas

1. Inventory high-risk undeveloped land
2. Access the status of existing insurance program participation

Scoring in the CVAT

NOAA's scoring methodology depends more on field observation and less on regional databases. The methodology can be expanded to include more in-depth analyses or contracted to focus on fewer vulnerability factors. This was felt to be especially useful in the case of Jamaica where data quality and data availability was often a constraint. Additionally, Jamaica's legal and institutional framework, political organisation, social structure and cultural norms are different from those in the United States (ODPEM, 2011). NB many databases have US figures as their base.

NOAA explains the scoring system as follows. *"The ideal method for assigning priorities to various hazards would be a scientific, quantifiable probability assessment. Unfortunately, probability data are not consistent among the different hazard types, nor are they always available or useable at the local level. As an alternative, communities can develop a relative priority matrix to use as a general guide for addressing different hazards"* (SWI 2011, p. 45).

6.3.1.4 THE CARIBBEAN CLIMATE ONLINE RISK AND ADAPTATION TOOL (CCORAL)

CCORAL was developed out of the *Caribbean Climate Risk Management Framework* and is a crucial component in the region's quest to build climate change resilience. CCORAL was developed by the Caribbean Community Climate Change Centre (CCCCC), with support from Climate and Development Knowledge Network (CDKN) and is currently being used in Barbados, Belize, Jamaica and Suriname.

CCORAL provides online support for climate resilient decision making. It is comprehensive in that, it assist users in seeing various activities through *"climate change' lens, and to identify actions that minimise climate related loss, take advantage of opportunities and build climate resilient development in their countries."*⁴¹

At the heart of the system is a risk management ethic that is vital in decision making. Furthermore, CCORAL *"takes a pragmatic approach, promoting the right tools and techniques to fit the context of Caribbean decision making, available time and resources and uncertainty about climate variability and change. Users are encouraged to prioritise*

⁴¹<http://ccoral.caribbeanclimate.bz/about>

*their efforts and use components of CCORAL of most value to them.*⁴²

CCORAL allows for:

1. Quick screening; Understanding of the climate influence;
2. Application of the climate risk management process;
3. Finding tools in CCORAL toolbox; and
4. Users to Learn more.

Specific guidance is provided for the following types of activity:

1. Legislation
2. National planning
3. Strategy and/or policy
4. Programme and/or project
5. Budget preparation/ evaluation

CCORAL can be used by a broad cross section of users in the Caribbean as it was developed to build climate resilience into their decision-making, at every level. Users include Governments, NGOs and civil society organisation (CSO), universities, research institutions, the private sector, the financial sector and development partners. The steps in the process are highlighted in Table 6.9 below:

Steps	Components
Screening exercise	When the organisation is developing its annual work plan. When the activity you are looking at begins to be developed.
Understanding climate influence	When the activity you are looking at begins to be developed. Throughout the activity.
‘End to end’ climate risk management processes	Before commencing a climate risk management process
The toolbox	Before commencing a climate risk management process
Useful links	Any time

Table 6.9: Steps in the CCORAL process. Source: CCCCC 2014.

It is worth noting that CCORAL can also be used after projects have been approved to review and assess if *“risks driven by climate variability and climate change were adequately addressed and managed in the design, construction and operation of the new assets.”*⁴³ By using CCORAL, users can also demonstrate to funders, investors and development partners that climate resilience has been integrated into all relevant activities.⁴⁴

⁴²Ibid

⁴³<http://ccoral.caribbeanclimate.bz/about>

⁴⁴<http://www.caribbeanclimate.bz/general/ccoral-risk-management-tool.html>

6.3.1.5 THE GUIDANCE TOOL: A Manual for Mainstreaming Climate Change Adaptation into the CDM Country Work Programme

The *Guidance Tool* (G Tool) for Mainstreaming Climate Change Adaptation into the *CDM Country Work Programme* was developed by CDEMA to assist its member States incorporate climate change adaptation principles into national DRM plans and strategies through a process referred to “as mainstreaming climate change adaptation into disaster risk reduction”. The “*describes a process of considering the implications of climate risks for all aspects of national development and adjusting development processes and disaster and climate change measures to address these risks*” (CDEMA 2011, p. iv-v).

The G Tool is not only practical and participatory; it also promotes the process of planned adaptation that takes advantage of Member States current national abilities to respond to both current and anticipated climate threats. Additionally the G Tool highlights opportunities provided by Member States current institutional modalities to ensure that short and medium-term adaptation activities are successful; while at the same time maintaining a long-term adaptation point of view.

The G Tool- key steps:

1. Scoping, stakeholder identification, and problem identification.
2. Review and assimilation of technical and socio-economic background information relevant to the identification and mainstreaming of adaptation options.
3. Analysis of factors affecting the mainstreaming of disaster risk reduction and climate change adaptation (using SWOT Analysis).
4. Preparation for a multi-stakeholder workshop (by participants and workshop facilitators).
5. Scenario development and the identification of climate change impacts, adaptation options and mainstreaming entry-points (prior to and during the workshop).
6. Implementation of workshop outputs (after the workshop).

6.3.2 COMPONENTS OF VULNERABILITY

Vision 2030 Jamaica promises an economy that is prosperous and recognizes that Jamaica’s vulnerability to natural and man-made hazards is a major threat to achieving that prosperity. “Natural hazards ...lead to natural disasters” ...which ...“have dire consequences for economic activities, infrastructure, human welfare and natural resources management” (PIOJ 2009a).

Vulnerability cuts across social, environmental and economic boundaries. The UNDP (2014) and Wilches-Chaux (1993) suggest a number of approaches to identifying vulnerability:

- Physical vulnerability: refers to the location of a population in an area of physical risk;

- Economic vulnerability: refers to income levels, unemployment, exploitation, work instability, difficulty in accessing educational services, health and leisure activities.
- Social vulnerability: refers to the level of organisation and internal cohesion of the society at risk.
- Political vulnerability: refers to the concentration of decision-making power, centralization in governmental organisations and weaknesses in political autonomy at the regional, local and community levels.
- Ideological and cultural vulnerability: refers to a particular worldview and a readiness to face problems. These could include passivity, fatalism, belief in myths, etc.
- Educational vulnerability: refers to the lack of educational programmes, inadequate instruction or instructors, capacity and materials, unavailability of education programmes that include DRR at local and regional levels, the community's level of understanding of the issues involved in DRR.
- Environmental vulnerability: refers to humans coexisting with the environment without domination and destruction. It also takes into account the vulnerability of ecosystems to direct and indirect human action, and the high risk associated with communities that exploit or inhabit them.
- Institutional vulnerability: refers to the obsolete and or rigid institutions in which bureaucracy, political power resides.

These are all interrelated and cannot be easily separated. Social, economic and environmental conditions in the context of Jamaica are examined in Section 6.3.3 below:

6.3.3 VULNERABILITY ANALYSIS BASED ON SELECTED CRITERIA

Economic Vulnerability

Jamaica has a relatively stable democracy and strong institutions; however, its debt has increased to about 138.9 per cent of GDP at the end of 2013⁴⁵. As reported previously, according to the PIOJ (2014) GDP for the Agriculture, Forestry and Fishing Industry declined by 0.5 per cent; real value added for the Mining and Quarrying Industry increased by 3.8 per cent representing an increase of 0.1 per cent point in contribution to GDP to 2.3 per cent; the Manufacturing Industry contracted by 0.8 per cent relative to 2012 and represented the second consecutive annual decline, and accounted for 8.4 per cent of GDP while the Construction Industry grew by 1.8 per cent in 2013 and accounted for 7.1 per cent of GDP (PIOJ 2014).

Jamaica's rate of inflation for 2013 was 9.5 per cent, 2.5 percentage points higher than the rate recorded for 2012 (PIOJ 2014). Between December 2013 and October 2014 inflation rate was 7.3 per cent⁴⁶.

⁴⁵ www.statinja.gov.jm/default.aspx

⁴⁶ Ibid.

Jamaica's chief economic earners are tourism, remittances and agriculture. Tourism and agriculture are highly dependent on Jamaica's natural resource base and are also vulnerable to hazards. The Natural Disaster Hotspot study, places Jamaica as having the second highest economic risk exposure to two or more hazards (GFDRR 2010; World Bank 2008). Between 1980 and 2008 Jamaica was affected by 27 natural hazards incidents with economic losses estimated at US\$2.599 billion. Storms accounted for US\$2.425 billion while floods accounted for US\$168.44 million⁴⁷.

Between 2001 and 2010, Jamaica was affected by ten events, resulting in an estimated cost of approximately J\$111.81 billion. In 2004, Hurricane Ivan resulted in damage totalling J\$35 billion while Hurricane Dean in 2007 left J\$23 billion in damage. The magnitude of these damage and losses is projected to rise significantly from an average 2 per cent of GDP to approximately 14 per cent by 2025 (PIOJ 2012b). It should be noted, however, that effective DRR measures can reduce this projected increase.

Despite the foregoing, the Jamaican government has not engaged in a systematic programme of risk transfer for its vulnerable assets, although some government agencies do insure their assets. Jamaica contributes to the parametric Caribbean Catastrophic Risk Insurance Fund (CCRIF). This fund makes payments based on a hazard reaching certain pre-determined trigger points rather than on loss or damage (IDB 2009).

Social Vulnerability

Social vulnerability is intimately tied to social processes in disaster prone areas and is also usually related to a population's fragility, susceptibility or lack of resilience when faced with various hazards (Plate 6.9). Simply put, disasters are socio-environmental in nature and their occurrence is the result of socially created risk. This means that in order to reduce disaster risk, society must embark in a holistic decision making process (IDB 2007; IDB 2010). Social vulnerability in Jamaica is exacerbated by a number of issues including but not limited to:

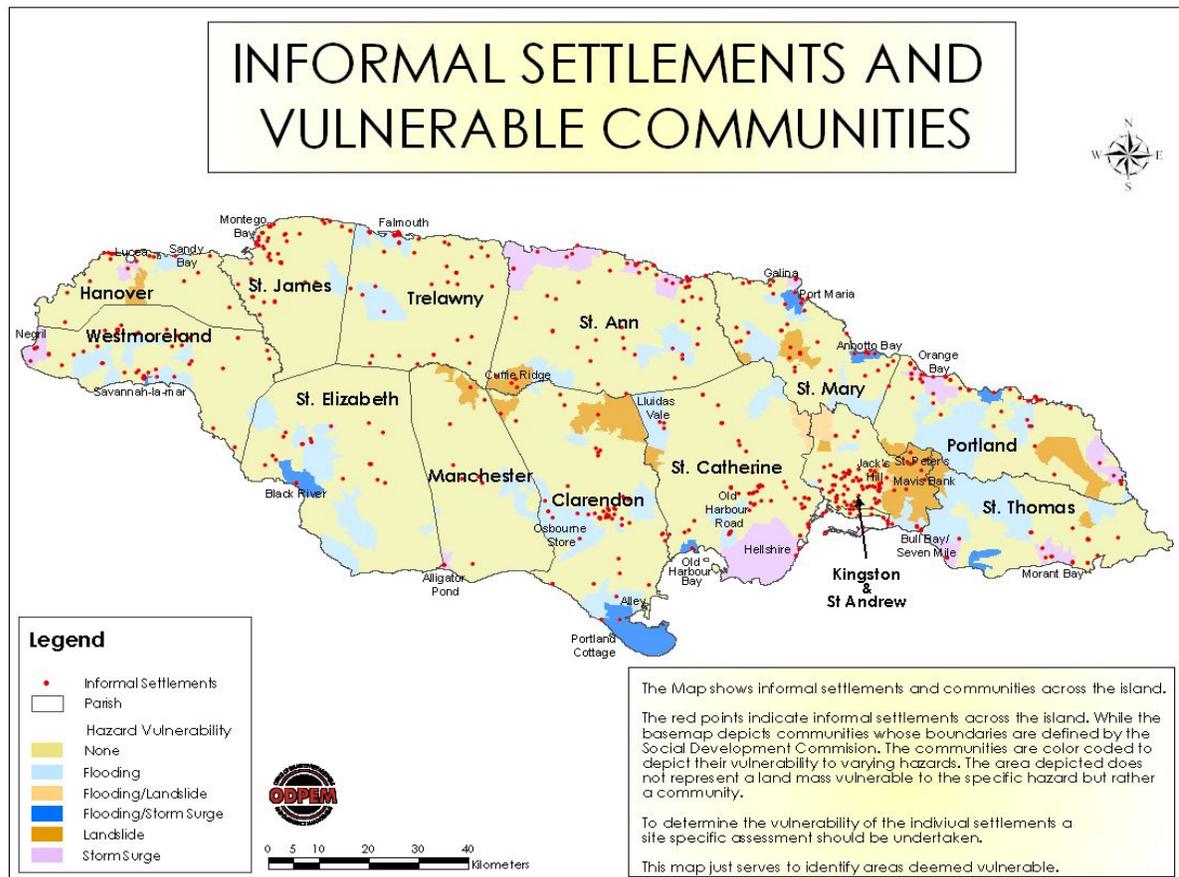
1. population demographics- elderly population 65+, children 14 years and under, the disabled,
2. household characteristics (mostly headed by single females),
3. community structure (including roads etc.), and
4. land use (including squatting on unsuitable land).



Plate 6.9: Inundated house in Wilton, St. Elizabeth in which senior citizens were trapped for four days after the passage of tropical storm Nicole (2010). Source: PIOJ 2010

The Government of Jamaica's Rapid Assessment Report (2008) revealed that an estimated twenty per cent (20 per cent) of Jamaica's population reside in squatter settlements. The report named three types of squatting in Jamaica: agricultural, residential and commercial, the most dominant type being residential with sixty six per cent (66 per cent) of the settlements surveyed having been in existence for more than twenty (20) years. Squatter sites range from less than ten (10) units or households per site to in excess of two thousand households in large settlements. See Appendix 4 for the distribution of squatter settlements across Jamaica.

Map 6.7 shows the exposure of informal settlements and other communities to hazards. Communities which are vulnerable to hazards are shown as shaded areas, the shading matching community boundaries as defined by the Social Development Commission (SDC). Individual communities are not depicted. The informal settlements, indicated by red dots, are found in all parishes. The map shows the exposure of both formal and informal settlements to hydro-meteorological and geological hazards.



Map 6.7: Informal settlements and vulnerable communities. Source: ODPEM.

UNDP (2014), reports that poverty and vulnerability often reinforce each other and are very dynamic. It suggests that the poor are inherently and intrinsically vulnerable. Social vulnerability in Jamaica is also linked to poverty as highlighted by the HDI (0.715) for

Jamaica. Risk transfer is limited, as household insurance does not have very high penetration in Jamaica. The authors were unable to access differentiated figures for household and other types of insurance, and no figures were available for the level of penetration for the country. Anecdotal evidence suggests that many house-holders, and micro, small and medium enterprises do not insure because the cost is considered to be too high. Lack of insurance or any other risk transfer mechanism, can reduce the ability to recover after a disaster and can increase vulnerability of householders as well as the micro, small and medium business sector. Mortgage and financial institutions require insurance of mortgaged properties, but these are sometimes allowed to lapse once the mortgage payments are completed.

Environmental Vulnerability

Jamaica's natural environment - biodiversity, ecosystems, marine and coastal resources, fresh water resources, and forests and watersheds, continue to come under stress from climate change related pressures. These include extreme weather events, sea level rise and coastal erosion among others.

Over the past 25 to 30 years, Jamaica has experienced an increase in the frequency of natural events, mainly floods (as a result of tropical depressions, tropical storms and hurricanes), droughts and landslides (PIOJ 2012). The adverse impacts of hurricanes include a decline in the health of coral reefs; loss of sea grass beds; severe beach erosion and loss of forested areas. It is projected that the island has been, and will continue to be affected by increased frequency and intensity of tropical weather systems, which can partly be attributed to climate change (PIOJ 2012).

There is recognition that healthy, productive and protective environments, social systems and economies are the bases of development, sustainability and human welfare. In 2013 Jamaica was ranked 55th out of 178 countries in the Environmental Performance Index (EPI) with a score of 58.26⁴⁸. In 2009 there were no hazards which caused damage but in 2010 there was significant damage (representing 1.9 per cent of GDP) and losses mainly from floods associated with tropical storm Nicole (PIOJ 2012).

Most Vulnerable Groups

According to UNDP (2014, p. 2), *“human vulnerability is not new, but it is increasing due to financial instability and mounting environmental pressures such as climate change, which have a growing potential to undermine progress in human development.”* When developing DRR strategies or guidelines, there are a number of factors that must be considered in order to achieve the desired result of reducing risk among vulnerable groups, and ensuring that these groups maintain their health and retain functional capacity. These factors include:

1. Communication – where timely, accurate, understandable and practical information is provided.
2. Coordination – sets the stage for complementary action.

⁴⁸<http://epi.yale.edu/epi/country-profile/jamaica>

3. Education – which seeks to increase general awareness and knowledge of disasters including how to act, or defines what to do in the different phases of a disaster.
4. Accommodation/inclusion – ensuring that policies and activities take into account the needs, capacities, vulnerabilities and perspectives of all age groups (PAHO 2012).

Several vulnerable groups have been identified in Jamaica - these include children, youths-at-risk, the elderly, PWDs, women, and poor families. UNDP (2014) refers to these persons as ‘structurally vulnerable’. In Jamaica the most vulnerable populations also include men and women living in rural communities, coastal zones and low-lying areas, people with poor housing and the homeless (UNDP 2009). It is estimated that persons at risk make up 60 per cent of Jamaica’s total population and are generally vulnerable to storm surges, hurricanes and flooding⁴⁹. UNDP (op. cit.) notes that women are more vulnerable to personal insecurity than men.

Women

Women are usually overlooked and as a result are often invisible in disaster management (Senior and Dunn 2009). Poverty increases the vulnerability of women when there is a disaster because there is often a larger proportion of a woman amongst the poor population and hence they are often the most at risk (Senior and Dunn 2010; UNDP 2014). Senior and Dunn (2009) iterated that a higher level of poverty and increasing vulnerability to poverty are tied to women’s participation in the labour force typified by lower rates of employment and higher rates of unemployment in comparison to men.

In the Survey of Living Conditions 2010 Jamaica continued to register a large percentage of female-headed households (FHHs), which stood at 47.1 per cent. FHHs with children and but no male present represented 55.3 per cent of FHHs (PIOJ 2011). Since 1993 Jamaica has recorded a high percentage of FHHs, increasing from 41.5 to 43.5 per cent in 2002 to 46.7 per cent in 2006 (PIOJ 1998; PIOJ 2007a). FHHs are considered one of the most vulnerable groups in Jamaica (UNDP, 2009). They tend to include more children who in turn are considered vulnerable. As noted in a 2010 study the percentage of FHHs remains high and is largest in the poorest section of the population. The high levels of FHHs affects the ability of women, particularly in poorer households, to access healthcare, which is often sacrificed for other economic priorities including food, shelter and education (PAHO 2010).

Children

In 2013 children under 15 years old totalled 652,300 or 24.0 per cent of the total population (2,718,000) a decline from the previous year. This decline was also evident in the 2011 Census where the number of children ‘under 15 years of age’ was approximately 702,800 or 26 per cent of the total population of 2,697,983 persons. In Jamaica children’s vulnerability is linked to being in poor families in general and FHHs in particular as women tend to earn less than men and are often the poorest in the

⁴⁹(Senior and Dunn 2012; Working Group 1 Vulnerabilities and Capacities 2012; Senior and Dunn 2009).

population. In 2006 the average number of children was 3.6 in female-headed households and 3 in male-headed households (UNESCO 2011; PIOJ 2014).

The Elderly

The vulnerability of a person or group will affect their ability to cope and survive in a disaster. Older persons, as a group, are often identified as among the most vulnerable segments of any population. According to PAHO (2012) a large segment of the 60 + population (approximately 20-30 per cent) has one or more disability, that is, physical, mental or sensory, and this percentage increases by each five-year age group, to more than 50 per cent in the 80+ group. Pensioners, 65 years and over, are entitled to an exemption of \$80,000.00 forage relief & 80,000.00 pension relief, plus \$507,321.00 – income tax threshold, totalling \$667,312.00⁵⁰.

“Jamaica’s elderly population (60 years and over) is the fastest growing age group in Jamaica’s population. The dependent elderly (65 years and over) was estimated at 207,700 (7.8 per cent) in 2005 and by 2007, had grown to 223,961 (8.4 per cent). Over the period 2007 to 2030, it is estimated that this cohort of Jamaica’s population will increase by 2.8 per cent to 11.2 per cent or 321,664” (PIOJ 2009a, p. 40).

The Active Ageing Framework presents one approach to mainstreaming the consideration of older persons into the disaster management process. The process seeks to optimize opportunities for health, participation and security to enhance an individual’s quality of life as he/she ages. The framework integrates not only the needs but also the contributions of older persons to disaster management programmes and processes. It should be noted that an advanced age does not by itself constitute vulnerability. Rather, it is the problems associated with old age that increases a person’s vulnerability. These issues may include deteriorating physical and mental ability, decreased strength, low tolerance for physical activity, functional limitations and decreased sensory awareness (PAHO 2012). Thus, the elderly are often at risk before, during and after disasters because of auditory, visual and mobility impairments as a result of which they may not hear/see warnings and/or may not be able to evacuate unaided.

For the aged, chronic diseases, mental health issues, limited mobility, and special nutritional requirements all play a major role in their ability to access healthcare and social services such as shelter, water and food during and after a disaster. They are also impacted by social factors including poverty, educational levels, gender, life changes, family living arrangements and home ownership (PAHO 2012). In addition, elderly persons without a pension or other source of income will find it more difficult to prepare for, respond to and recover from disasters.

Elderly without Pension

Under *Vision 2030 Jamaica*, National Goal # 1 states *Jamaicans are empowered to achieve their fullest potential* and National Outcome #3 is *Effective Social Protection* (PIOJ 2009; PIOJ 2009a). There are currently two (2) government programmes to protect

⁵⁰<http://www.jamaicatax.gov.jm/index.php/2012-05-14-21-22-08/pensioners>

the elderly in Jamaica namely, the National Insurance Scheme (NIS) and the Programme of Advancement through Health and Education (PATH). One of the five categories of beneficiaries' under PATH is the elderly 60 years and over and not in receipt of a pension. Since 1999 the pension's scheme has been continuously reassessed to ensure equity for beneficiaries. Despite ongoing efforts, lack of or inadequate pension benefit is a factor that increases the elderly's vulnerability to disasters in Jamaica (PAHO 2012; UNPF/HAI 2011).

Following a 67 per cent increase in benefits under the Path programme in August 2013 beneficiaries received a further 15 per cent increase in October 2014. A total of 330,000 persons benefited from \$5.3 billion under the Social Protection Project 2014 - 2015 (Smith-Edwards 2014).

According to UNPF/HAI (2011) at the end of 2010 there were 51,846 older beneficiaries under PATH this represented 16 per cent of programmes total beneficiaries. In general PATH beneficiaries made up 17.3 per cent of persons 60 and over. In combination with NIS pensioners, coverage for older persons in Jamaica totaled 119,177 persons or 39.8 per cent from this there is a coverage gap of 180,323 or 60 per cent of Jamaica's older population. At the end of December 2010, 67,331 persons were in receipt of pension benefits from the National Insurance Scheme (PIOJ 2011). The Government of Jamaica is now examining the matter of pension reform with a view to making pension contributions compulsory.

Persons with Disabilities

From the 2001 Population Census it was estimated that 6.3 per cent or 163,206 of Jamaica's population had at least one disability. It is generally believed that the level of disability in a population is often understated and as a result, the World Health Organisation (WHO) estimates that for most countries the level of disability would be about 10 per cent of total population figures. If this estimation is correct in Jamaica "the level of disability as revealed by the census grossly understates the extent of the problem. It may therefore be assumed that PWDs comprise a larger than stated segment of our population and have been marginalized from the mainstream of development in the society" (PIOJ 2009a, p. 40).

Limitations related to the visual and the hearing impaired is particularly significant in coping in disasters. In Latin American and Caribbean cities 35 per cent of the population reports some form of visual impairment. This results in persons being unable to read or understand signs for warnings and to evacuate buildings safely without injuring themselves. The visually impaired elders sometimes do not want to leave their homes to go to shelters because they feel less comfortable in public space. Loss of hearing aids during a disaster also makes it harder for these persons to access information, which leads to anxiety and stress which then impacts their ability to respond (PAHO 2012).

Jamaica reports progress in reducing the vulnerability of populations most at risk, but achievements are not comprehensive (ODPEM 2011).

The UNDP (2014, p. 3) notes that PWDs “often lack easy access to public transportation, government offices and other public spaces such as hospitals, which makes it more difficult to participate in economic, social and political life—or to seek assistance when faced with threats to their physical well-being”.

Jamaica’s *Disabilities Act* (2014) aims to remove discrimination and provide full access to persons with disabilities to every facet of the Jamaican society. It is described as “(A)n ACT to promote, protect and ensure the full and equal enjoyment by persons with disabilities, of privileges, interests, benefits and treatment, on equal basis with others and to establish the Jamaica Council for Persons with Disabilities; and for connected matters” (GOJ 2014).

A framework has been developed to minimize risk to vulnerable populations impacted by disasters. This forms part of the national development plan, *Vision 2030 Jamaica*. According to Smith-Edwards (2014a), the Government of Jamaica through the Ministry of Labour and Social Security (MLSS) has implemented several programmes to address the needs of vulnerable populations who are affected by disasters:

1. The Programme for Advancement through Health and Education (PATH) under which the GOJ signed a grant agreement, in June, with the Japanese Government for US\$2.9 million to implement the Social and Economic Inclusion of Persons with Disabilities Project;
2. Post disaster rehabilitation programmes which include compassionate grants and rehabilitation grants.

In addition, there are other programmes that are operated by NGOs such as the Red Cross, Food for the Poor, Salvation Army and ADRA that provide assistance to vulnerable persons (housing, skills training, healthcare, food assistance and clothing).

6.3.4 ACHIEVEMENTS IN REDUCING VULNERABILITY

Jamaica has reported achievements and constraints in reducing vulnerability (HFA 2010).

1. Rehabilitation grants to assist with rebuilding are provided after evidence of the ability to relocate to safer locations. In recent times, this has been supported by No Build Orders by the local authority and public education drives spearheaded through community-based organisations.
2. A *National Shelter and Welfare Action Plan* developed by the National Disaster Office in conjunction with the National Shelter and Welfare Committee, which clearly outlines the roles and responsibilities of the welfare agencies in responding to emergencies along a three tiered response strategy.
3. A squatter management unit has also been implemented with the mandate of coordinating the national response to existing informal settlements as well as those which are emerging.
4. A draft *Homeless Policy* (conceptual framework to become Green Paper) has also been developed.
5. Ministry of Labour and Social Security and Ministry of Agriculture grants.

6. Crop and property insurance by PC Banks, Co-operatives, partner schemes

An important step in emergency warnings for PWDs was taken recently when ODPEM in collaboration with the NGO Panos Caribbean, implemented the Portmore Early Warning System (EWS) for the Disabled Project in 2013. The Alert and Warning System is routed through a web based application hosted by a local radio station. Application of the system involves routing hurricane related information (hurricane preparedness, warnings and evacuation notices) to handheld devices distributed to blind/visually impaired and deaf/hearing-impaired users. Blind/visually impaired persons are alerted by a distinct sound made by the device for incoming messages that are read audibly to the user. The deaf and/or hearing-impaired are able to detect notifications by a flashing light. Incoming messages are displayed on the screen. The effectiveness of the system is being evaluated.

Constraints:

1. Enforcement of the provisions of the Disabilities Act
2. Absence of a dedicated budget for the lead agency/ministry to reduce the vulnerability of populations most at risk. Budgetary allocations lean more towards addressing poverty alleviation strategies through the Government's Public Assistance Programme rather than adopting a socio-cultural approach to reducing risk.

The *Relief Policy*, *Emergency Relief Clearance Policy* and *Shelter and Welfare Action Plan* provide the framework for providing assistance to the vulnerable population in post disaster situations.

6.4 CAPACITIES

In the UNISDR Terminology 2009 capacity development is defined as “*the process by which people, organisations and society systematically stimulate and develop their capacities over time to achieve social and economic goals, including through improvement of knowledge, skills, systems, and institutions*”. For the UNDP (2010, p. 2) capacity development is “*the process through which individuals, organisations and societies obtain, strengthen and maintain the capabilities to set and achieve their own development over time*”. This kind of development is not only locally driven but seeks to bring transformation across societies, it sees individuals, organisations and societies themselves as indispensable in the process of reducing and managing disaster risks (UNDP 2010).

Capacity can be built on a number of levels - firstly at the individual level where the focus is on training/skills building. Training however, cannot be done in isolation as it is only one aspect of capacity building. Secondly, the organisational level which focusses on organisation development and the application of its internal policies, procedures, and frameworks instrumental in driving disaster management. Thirdly, the societal level, where the focus is on how to lower society's vulnerability while boosting its capacity to

cope with hazards. Lastly, the sectoral level where sectors such as education, health and housing become the focus of intervention and assessment.

The following assumptions are vital to building DRR capacities both at the national and local levels (UNDP 2010):

1. The development of DRR capacity is the concern of an entire society, rather than any single agency, professional discipline, or stakeholder group.
2. An enabling environment- i.e. strong political ownership and commitment at the highest levels of authority, extensive participation, transparency and clear public accountability-is essential for translating capacity into performance.
3. Locally generated, owned and sustained capacity is essential to the success of any DRR enterprise.
4. The development of technical capacities associated with professional disciplines or functions-such as environmental management or land-use management- needs to be combined with other types of capacity development that include the promotion of leadership and other managerial capacities and performance-enhancing measures.

Jamaica, generally, has adequate technical capacity for risk reduction at national level spread across public and private sectors and academia. Where there are gaps, such as in seismic risk assessment, the country has access to such capacity through the University of the West Indies which completed the recent seismic risk assessment of Kingston.

Gaps

According to the *Jamaica's HFA Progress Report (2013)* Jamaica's DRR capacity is weak at the national, community and local levels. Lack of, or inadequate levels of resources, be it human, financial, technical or operational; and lack of institutional commitment remain Jamaica's greatest challenge.

However, the process to fully integrate hazard information into the planning and development process in Jamaica made significant strides through the development of a policy whereby all development applications have to be reviewed by the national disaster management office. In addition, hazards and vulnerability assessment and ranking tools have been developed and are being used on a wide scale by ODPEM.

Under the national DRM programme, there are plans to identify and strengthen capacities for risk reduction in Jamaica for example, through the development of a framework for action to address issues on capacity building in DRR.

In the long term, hazard mapping will be done for all hazards affecting Jamaica. A multi-sector approach to disaster management will be developed with continued improvement in the collection, management, use and dissemination of technical data as it relates to DRR. However, ODPEM has noted during discussions with the authors that there is a lack of buy - in from some key stakeholders.

The HFA Progress Report (2013) notes:

1. The National Hazard Risk Reduction policy has not been widely disseminated and currently there is no implementation or action plan in place.
2. Strategic planning for DRR is not integrated into key sectors and agencies
3. The current Disaster Preparedness and Emergency Management Act needs revision to make it more applicable to changing disaster management practices.
4. Absence of a finalised Risk Mitigation Strategy and Action Plan
5. Absence of local action plans for DRR
6. Too much dependency on overseas development assistance for DRR activities
7. Absence of a dedicated budgetary allocation at both the local and national levels to carry out risk reduction programmes
8. The Parish structure needs strengthening so that community involvement is effectively employed to support the DRR Planning and Response at the Municipal Level thereby strengthening the governance process for DRR at the local government level.
9. Resource constraints exist, which sometimes affect resources deployed at the community level.
10. Socio-economic conditions of some communities act as a barrier to DRR acceptance
11. Capacity assessment of the national and parish mechanism and reporting to the National Disaster Committee is necessary.
12. A general lack of resources to address capacity building in all vulnerable communities.
13. Information provided to local/community level is generally not translated into action because of lack of resources
14. There is little ownership of disaster management responsibility at the different sector levels
15. Limited pre-impact baseline data exists
16. While the link has been made in terms of disasters and environmental protection there needs to be greater collaboration among agencies especially as it relates to monitoring and enforcement, sharing of data and public education strategies.
17. The Local Authorities lack adequate capacity to administer disaster management responsibilities.
18. Comprehensive management of human settlements is limited
19. Not enough drills and simulation exercises are conducted across all administrative levels.
20. Contingency plans in place - but are not gender sensitive.
21. Contingency plans are not in place in all agencies.
22. Economic constraints serve as a hindrance to keeping the National Disaster Fund adequately resourced.
23. No Sub-National Risk Transfer Fund is in place outside of the poorly-resourced National Disaster Fund.
24. No Catastrophe Bonds programme currently exists.

Jamaica is a subscriber to the Caribbean Catastrophe Risk Insurance Facility (CCRIF) which uses a parametric scale to provide risk insurance to cover catastrophic events. However, after impacts from Hurricane Dean (2007), tropical storm Nicole (2010) and Hurricane Sandy (2012), Jamaica has been unable to access the CCRIF since all the parameters for a pay-out were not triggered during these events. This creates economic constraints on the NDF and the economic growth of the country as there is no sub-national risk transfer arrangement in place (ODPEM 2011). However, “after Hurricane Sandy in October 2012 the GOJ received a discretionary grant of US\$100,000 from the CCRIF to support its post-disaster recovery and restoration initiatives following the effects of Hurricane Sandy” (PIOJ 2014, p. 3.6).

“In addition to the budgetary allocation for general disaster management indicated in Table 6.10, the Government purchased US\$122.0 million worth of insurance coverage for hurricane and earthquake damage under the Parametric Insurance Policy with the (CCRIF). The coverage limit was approximately US\$62.2 million for damage caused by hurricanes and US\$59.8 million for earthquake damage” (PIOJ 2014, p. 3.5).

BUDGETARY ALLOCATIONS FOR SELECTED ENVIRONMENTAL MANAGEMENT AND RELATED PROGRAMMES, FY 2012/12 - FY 2013/14							
	Revised Estimates 2012/13			Estimates 2013/14			PerCent Change
	RECURRENT	CAPITAL A&B	TOTAL	RECURRENT	CAPITAL A&B	TOTAL	
Environmental Protection ^a	712 820	381 616	1 094 436	776 890	450 663	1 227 553	12.2
Waste Management	904 100	116 000	1 020 100	721 188	40 000	761 188	-25.4
Forestry	436 299		436 299	478 111		478 111	9.6
Disaster Management ^b	287 337	308 928	596 265	297 353	209 000	506 353	-15.1
Fire Protection	3 244 215	89 000	3 333 215	3 314 082	223 915	3 537 997	6.1
Land Resources Management ^c	1 587 070	337 042	1 924 112	1 589 068	335 673	1 924 741	3.3
Water Resources Management	142 264	10 109	152 373	144 427	21 516	165 943	8.9
Total	5 885 105	1 242 695	8 556 800	7 321 119	1 280 767	8 601 886	0.5

a - Environmental Protection includes NEPA, and environmental management under the MWLECC
b - Disaster Management - Office of Disaster Preparedness and Emergency Management and Emergency Management of the Ministry of Health
c - Land Resources Management - Land Use Planning and Development (including Squatter Management); Rural Development (survey, land administration, settlement and land reform); and Municipality Development

Table 6.10: Budgetary allocations for selected programmes. Source: PIOJ 2014.

6.4.1 INSTITUTIONAL ASPECTS

In general, disaster management has been in focus in Jamaica for more than 38 years, but government economic and spatial development policies still do not fully address many of the issues which hinder risk reduction. Clear guidelines are necessary to facilitate the integration of DRM in sustainable development policies and plans and also project development (World Bank 2010). Under *Vision 2030 Jamaica* capacity building as it relates to DRR is considered fundamental to Jamaica’s development (Figure 6.11). Historically there has been little integration of DRR in socio-economic decision making. However, the recent Growth Inducement Strategy includes considerations of resilience

(Carby 2012), and *Vision 2030 Jamaica* includes as one of its goals that Jamaica will have a healthy natural environment by 2030 (PIOJ 2009a).

Goal 4 will be accomplished via three broad initiatives:

1. sustainable management and use of environmental and natural resource;
2. sustainable urban and rural development; and
3. hazard risk reduction and adaptation to climate change.

In Jamaica, at the institutional level, capacity - particularly that of local governance systems and proper identification of hazards and elements at risk remain the most challenging areas. If these challenges are overcome a more comprehensive approach can be instituted to address issues of mitigation (both structural and non-structural) and risk transfer. As a result the strengthening of national and local preparedness programs and early warning systems would be realised. At the institutional level there are a number of actions to be completed namely, identifying critical priorities for capacity building through various means for instance, legislation, hazard identification, and hazard mapping of unmapped areas. In addition it is also envisaged that there will be a sustained capacity-building program for DRM for all local planning authorities, institutions and communities in Jamaica (World Bank 2010).

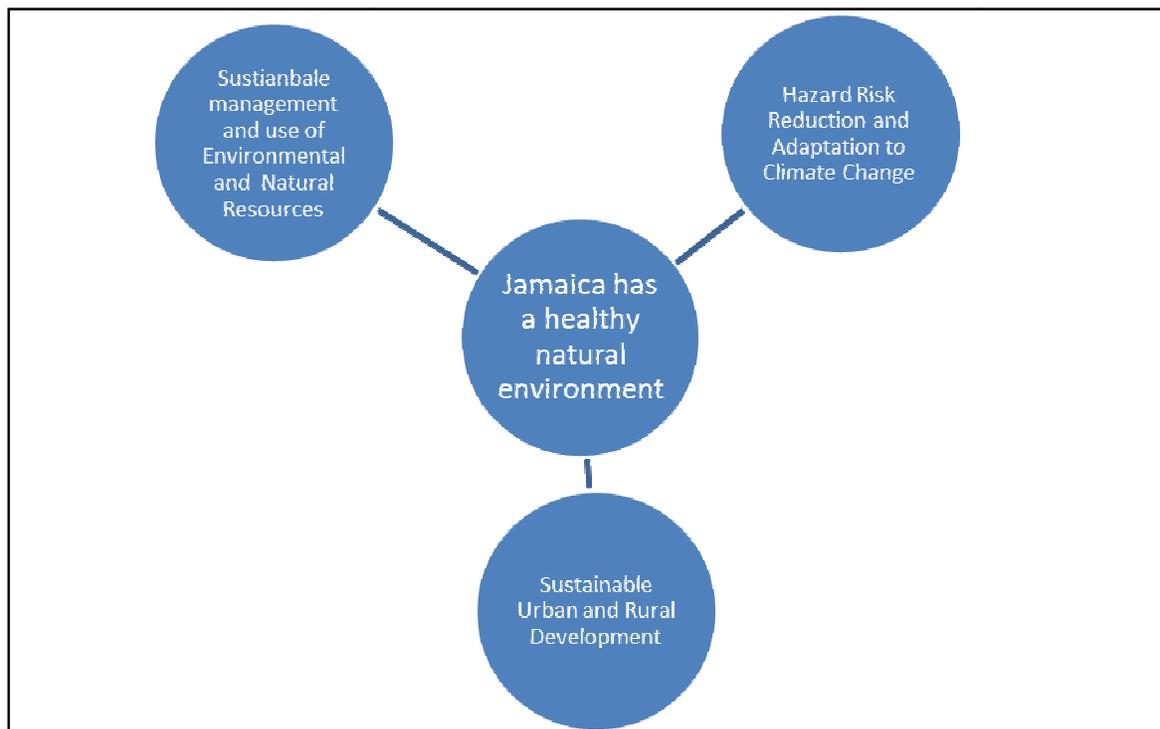


Figure 6.11: Goal 4 - Jamaica has a healthy natural environment and related national outcomes. Source: PIOJ 2009a.

Vision 2030 Jamaica will place greater emphasis on hazard risk management activities and programmes for reducing existing and future vulnerability, including incorporating

climate change scenarios into future economic and land use planning. The *National Communication on Climate Change* has been prepared from which an Adaptation Strategy will be developed. *Vision 2030 Jamaica* “provides a framework to ensure that we reduce the risks associated with natural hazards and climate change by integrating hazard considerations into our country’s development planning” (PIOJ 2009a, p. 246).

Under national Outcome #14: Hazard Risk Reduction and Adaptation to Climate Change a number of challenges have been identified, including:

1. Jamaica’s location, geology and geography: Jamaica’s location, geology and geography make the island prone to natural hazards resulting in frequent damage to infrastructure etc. (*See Section 1 for more details*).
2. Settlement Patterns: Increase in population, urbanization and poverty have led to the growth of squatter settlements in environmentally sensitive areas. Many of these are located in vulnerable areas including flood plains, on steep unstable slopes and along the coastline. Notably, 82 per cent of Jamaica’s population live along and within 5 km of the coast which increases vulnerability to hazard impacts.
3. Weaknesses in the physical planning system and land use practices: Past hazards have exposed Jamaica’s vulnerability, highlighted weaknesses in physical planning, land use and building practices. Current land use policy and practice do not adequately incorporate current scientific, technical, and local knowledge about the relationship between hazard risk and socio-economic vulnerability.
4. Inadequate emphasis on hazard risk management activities: Too little emphasis placed on hazard risk management activities and programmes to reduce existing and future vulnerability. There is urgent need for a greater degree of hazard data collection and mapping, vulnerability assessment, risk assessment, watershed management and the use of risk transfer measures, for example, insurance.
5. Environmental Degradation: due to increased environmental degradation there has been increased risk of impact from hurricanes and intense rainfall. For example, in Negril loss of seagrass cover has been instrumental in the erosion of several tens of metres of beach. Heavy rain triggers numerous landslides on steep slopes, often damaging roads, houses and power and water lines.
6. Climate Change: Climate Change is expected to amplify the effects of several natural hazards to which Jamaica is exposed. Extreme weather events are expected to become more frequent and more severe. Sea level rise is also expected to affect coastal infrastructure and lead to saline intrusion into Jamaica’s underground fresh water resources.

Due to the consistent shortfall in human, financial and technical resources, the Jamaican Government and the lead agency ODPEM have used collaboration nationally and internationally to address on-going needs and priorities in Jamaica.

The PIOJ was accredited as a National Implementing Entity (NIE) under the Adaptation Fund (AF) by the Adaptation Fund Board (AFB). As the NIE, the PIOJ can access grants directly from the AFB to finance concrete climate adaptation projects instead of having to work through a multilateral agency in order to address Jamaica’s mounting problems (PIOJ 2011 and PIOJ 2012).

In order to build DRR capacity in Jamaica a number of national strategies have been articulated under *Vision 2030 Jamaica*. These, and the agencies responsible for carrying them out, are highlighted in Table 6.11 below:

National Strategies	Responsible Agencies
14-1 Improve resilience to all forms of hazards	Office of Disaster Preparedness and Emergency Management Office of the Prime Minister Ministry of Agriculture Ministry of Health and Environment National Environment and Planning Agency Ministry of Education Ministry of Finance and the Public Service Public Broadcasting Commission Local Authorities (Parish Councils) Meteorological Office
14-2 Improve emergency response capability	Ministry of Health and Environment Fire Services Red Cross Jamaica Defence Force Jamaica Constabulary Force Office of Disaster Preparedness and Emergency Management National Environment and Planning Agency
14-3 Develop measures to adapt to climate change	National Environment and Planning Agency Local Authorities (Parish Councils) Forestry Department Ministry of Agriculture Ministry of Health and Environment University of the West Indies University of Technology, Jamaica Office of the Prime Minister Meteorological Office
14-4 Contribute to the effort to reduce the	Petroleum Corporation of Jamaica

global rate of climate change	Ministry of Energy Ministry of Transport and Works Ministry of Health and Environment Ministry of Industry, Investment and Commerce Meteorological Office Ministry of Foreign Affairs and Foreign Trade
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Table 6.11: National Strategies and Responsible Agencies-Hazard Risk Reduction and Adaptation to Climate Change. Source: PIOJ 2009a.

These national strategies will be accomplished via a number of sector strategies. *Vision 2030 Jamaica* pledges to “build capacity across the country to limit the impact of hazards and incorporate hazard risk considerations into development planning” (PIOJ 2009a, p. 249). A rational framework for hazard mitigation will be developed and the overall development objectives will be pursued through cooperation, coordination and support between government, the private sector and civil society over the long term (PIOJ 2009a). The national strategies and their selected sector strategies are shown below in Table 6.12.

NATIONAL STRATEGIES AND THEIR SELECTED SECTOR STRATEGIES
<p>14.1 Improve Resilience to all Forms of Hazards</p> <p>Selected Sector Strategies</p> <ul style="list-style-type: none"> • Create and strengthen national platforms and establish the foundation for hazard risk reduction by engaging in multi-stakeholder dialogue • Use predictive tools for modelling, hazard data mapping and risk assessment • Modernize the legal framework related to hazard risk reduction • Create and introduce economic and financial market instruments for risk transfer • Use knowledge, innovation and education to build a culture of safety and resilience at all levels by integrating hazard risk reduction in the early childhood, pre-primary, primary, secondary and tertiary education syllabuses and research community; and develop hazard risk reduction training for different groups of stakeholders • Adopt a community-based approach to hazard risk reduction • Expand early warning systems to reduce the risk of hazards • Incorporate hazard risk reduction in environmental and natural resources management • Establish mechanisms for increasing resilience of the poor and most vulnerable • Establish measures to incorporate hazard risk reduction in land-use practices and human settlements • Create opportunities for private sector involvement in hazard risk reduction, including business contingency planning • Design housing settlements that are not vulnerable to hazards based on construction and rehabilitation techniques that enhance the long term usability • Regulate the importation, storage, distribution, use and disposal (the management

cycle) of hazardous materials
<p>14.2 Improve Emergency Response Capability</p> <p>Selected Sector Strategies</p> <ul style="list-style-type: none"> • Build adequate emergency response capability and early warning systems • Develop institutional capacity to respond to potential emergencies such as fires • Develop a larger core of trained volunteers to effectively manage emergency response • Build capacity of state agencies and facilities (e.g. hospitals, fire services) to manage any potential disasters • Increase capacity for search and rescue • Develop mass casualty plans • Develop procedures to cope with potential disasters (e.g. continuous education simulation exercises and drills) • Strengthen the regional mechanisms for emergency response
<p>14.3 Develop Measures to Adapt to Climate Change</p> <p>Selected Sector Strategies</p> <ul style="list-style-type: none"> • Create mechanisms to fully consider the impacts of climate change and ‘climate proof’ all national policies and plans • Identify strategic priorities for adaptation to climate change • Undertake research to identify sector-specific strategies for adaptation • Promote education and discussion about climate change through local and community media • Adopt best practices for climate change adaptation • Infuse climate change issues into the physical planning system • Create and introduce economic and financial market instruments for risk transfer • Apply disaster risk reduction framework to build on climate change mitigation measures
<p>14.4 Contribute to the Effort to reduce Global Rate of Climate Change</p> <p>Selected Sector Strategies</p> <ul style="list-style-type: none"> • Promote energy conservation and non-carbon-based forms of energy (see National Outcome # 10 on Energy Security and Efficiency) • Reduce deforestation rate through mechanisms such as reforestation programmes • Conduct research on Jamaica’s levels and sources of greenhouse gas emissions with a view to further reducing the emissions • Promote the use of clean technologies in the manufacturing sector (related to National Strategy 12-5) • Maximize the benefits of the Clean Development Mechanism (CDM) under the <i>Kyoto Protocol</i> • Lobby at the international level for high greenhouse gas-producing countries to become more energy • and resource efficient

Table 6.12: National Strategies and their Selected Sector Strategies. Source: PIOJ 2009a.

In order to tackle the issue of DRR in Jamaica a number of national strategies were identified, the responsible agencies named, and the priority sector strategies and the key actions to be taken over 3 years (2009-2012) formulated. See details below in Table 6.13 including the outcome/output of the strategies implemented.

NATIONAL STRATEGIES	PRIORITY SECTOR STRATEGIES FOR YEARS 1- 3	KEY ACTIONS FOR YEARS 1- 3	RESPONSIBLE AGENCIES	OUTCOME/Output
14-1 Improve resilience against all forms of hazards	Create and strengthen national platforms and establish the foundation for hazard risk reduction by engaging in multi-stakeholder dialogue	Undertake hazard risk management for coastal communities	ODPEM, NEPA	In process
		Undertake comprehensive mapping of the flood plains throughout the island	WRA	In process
		Strengthen Democracy and Governance in Communities related to Disaster Response (including gender issues)	ODPEM, SDC	Identification of gender focal point (National Disaster Committee)
		Undertake Storm Surge Hazard Mapping for Coastal Communities	ODPEM, SDC JSIF	In process
14-3 Develop measures to adapt to climate change	Create mechanisms to fully consider the impacts of climate change and 'climate proof' all national policies and plans	Create mechanisms to infuse climate change considerations into planning and legislative frameworks	MOHE ,OPM ODPEM, Met Office	Climate Change Policy and Action Plan (draft)
		Establish a National Climate Change Committee	MOHE, OPM, MET Office ²⁴⁸	Climate Change Policy and Action Plan (draft)
		Develop a Climate Change Communications Strategy	MOHE, OPM, MET Office National Environmental Education Committee	Completed
	Adopt best practices for climate change adaptation	Develop sector-specific action plans to assist with the mitigation and adaptation of climate change in all sectors	MOHE Met Service OPM ODPEM NEPA	Completed
		Develop public awareness programmes on climate change	MOHE NEPA Met Service NGOs OPM	On going

14-4 Develop mechanisms to influence the global rate of climate change	Lobby at the international level for high greenhouse gas producing countries to become more energy and resource efficient	Prepare 2nd National Communication to the UNCCCCF	MOHE Met Service OPM	Completed
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Table 6.13: Key Strategies and Actions under the National Outcomes for Years 1-3 (2009-2012). National Outcome #14 - Hazard Risk Reduction and Adaptation to Climate Change. Source: PIOJ 2009a; ODPEM 2011.

6.4.2 DISASTER RISK REDUCTION PROGRAMMES

Despite constraints, Jamaica continues to place emphasis on the implementation of various activities, projects and programmes in an attempt to reduce or prevent the impact and incidence of disasters. Most of the initiatives are focussed on increasing the ability of Jamaicans to withstand hazard impacts, by reducing their vulnerability, while developing their capacity to anticipate, cope with, resist and recover from hazard impacts (Appendix 1). Some of these initiatives include:

1. Revision of the DPEM Act;
2. Implementation of the Building Resilient Communities Project;
3. Development of the Vulnerability Ranking Methodology by ODPEM which reveals high risk communities with the aid of hazard maps;
4. The development of a disaster emergency plan for Jamaica's 41 child care institutions;
5. Pilot testing of the Risk and Vulnerability Methodology developed by UNEP. Through the Risk and Vulnerability Assessment Methodology Project (RiVAMP). A methodology was developed to include the role of ecosystems in reducing risk and vulnerability associated with natural hazards particularly with the impending threats of climate change in Jamaica (PIOJ 2012).

Additionally, since Jamaica is party to the UNFCCC and the *Kyoto Protocol* of 2010, climate change adaptation activities are included in the development of a number of projects to build climate resilience, namely:

1. the Pilot Program for Climate Resilience (PPCR) and
2. the Climate Change Adaptation and Disaster Risk Reduction Project which will be implemented over a thirty (30) month period at a cost of US\$4.8 million dollars aimed at rehabilitating and increasing the reliance of Jamaica's watersheds, forested areas and coastal ecosystems and generally increasing the capacity of Jamaicans at the local and national levels to address climate change by raising awareness (PIOJ 2012).

Another project was designed to assist vulnerable small farmers develop plans for the hazards to which their farms are exposed currently and for projected climate change effects.

Sectoral DRM programmes have been implemented in Agriculture, Education, Health and Tourism ministries. The agricultural sector has a *National Agricultural Disaster Risk Management Plan (NADRM)* which sets out a strategic framework for disaster risk management for the sector. The Plan lists the following components:

1. Mitigating, preventing and preparing for the impact of disasters on the agricultural sector;
2. Promoting appropriate and effective emergency response to the impact of hazards and disasters;
3. Ensuring timely and effective recovery and rehabilitation from the impacts of disasters; and
4. Establishing a monitoring and evaluation framework that will effectively measure progress in ADRM.

The Plan also proposes operational linkages between national and parish structures and lists standard procedures for management of disasters and hazard impacts. Furthermore, NGOs such as Oxfam, ACIDI/VOCA, FAO and other organisations work with small farmers in disaster risk management and climate change adaptation.

6.4.3 TOOL INVENTORY

According to the *Methodological Guide on the Systemization of Tools for Disaster Risk Management* (DIPECHO 2011, p. 9), a tool is “a guide, product or instrument that has resulted from a project, initiative, program, experience or intervention, and serves to improve the ability to design, develop and implement an action or actions in the field of disaster risk management.”

The Guide suggests that when tools are being selected, it is important to estimate the impact the tool has had on practical development in communities, institutions, organisations or particular countries. Furthermore, tools that are selected must meet certain criteria for instance, they must be:

1. Functional: That is, tools must have been implemented before and seen to work. Otherwise, they should be assessed according to the contribution, impact or knowledge gained through its application.
2. Tangible: Based on access to the product, results and or information on their application in particular contexts.
3. Applicable, Adaptable, Replicable: Must be both adaptable and applicable and have the potential for replication in other contexts or settings.
4. Validated: Testable because they have been used and / or tested.

Tools are also required to comply with other common sense criteria, such as cost efficiency, degree of sustainability, innovation, participation, applicability among others. To ensure that systemisation can be accomplished and the tools selected are relevant, it must be ensured that the selected tool also meets the following criteria:

1. Effective, meaning its application has been made within the last five years.

2. There is access to basic information about the tool and its application may be verified through different sources and people (who designed, implemented, or benefited from the tool's application).
3. There is access to contact users and people who designed / implemented the tool.
4. There is sufficient information both for gathering information and verification of the tool (Guide, 2011).

Examples of tools:

1. **Safe Hospitals:** Hospital Safety Index (HIS);
2. **Monitoring (surveillance):** Rainfall Measurement Equipment, technologies for the monitoring of environmental variables etc.;
3. **Communications:** Communication equipment, communication protocols etc.; Manuals, guides, response protocols, documents, training; drills and simulations; hazard mapping methodologies, guide design and use of evacuation signs and labels.
4. **Education:** Guides, community education, materials and training, indigenous languages or cultural elements of a community or region; games education-dramas; culture is important and educational programs are aimed at people with specific needs (e.g. disabilities, minority languages, the elderly, illiterate and others);
5. **Disclosure:** Community Alert manuals.
6. **Other:** CD containing software or a database (Example: hospitals virtual methodology for vulnerability analysis; methodology for mapping at-risk sites.

The tools used in DRR are geared toward promoting best practices and increasing resilience. There are a number of tools currently being used in Jamaica. These are highlighted in Table 6.14 below, which is not exhaustive.

Name	Institution	Status
Vulnerability Assessment Benchmarking Tool (B-Tool)	ODPEM, UWI	In use
Health Sector Self-Assessment Tool	MOH	In use
Safe Hospitals Programme	PAHO	
Hazard Maps	ODPEM, MGD, WRA, NEPA	In use
Local Government Assessment Tool	Portmore Council	In use
National HFA Monitor	ODPEM, MOH, MOE, PIOJ	In use
RiVAMP	PIOJ	In use
Disaster Risk Indices	PIOJ	In use
Vulnerability Indices	ODPEM	In use
Booklets	ODPEM, PIOJ, MOE, MOH	In use
Brochures	ODPEM, PIOJ, MOE, MOH	In use

Guides	ODPEM, PIOJ, MOE, MOH	In use
CVAT	ODPEM	In use
School Safety Programme	USAID	Used
NOAA CVAT	ODPEM	In use
HAZUS MH	UWI	In use
Safe Cities Programme	Portmore Municipal Council	In use
Hospital Vulnerability Assessment	MOH	Used
Guidance Tool for Mainstreaming Climate Change Adaptation	CDEMA	In use
Damage and Loss Assessment Methodology	PIOJ	In use
Caribbean Climate Change Adaptation Toolkit for Jamaica	ODPEM, RED Cross, UWI, PIOJ, International Federation of Red Cross	In use
The Vulnerability Ranking Methodology (VRM)	ODPEM	In use
The Caribbean Climate Online Risk and Adaptation Tool (CCORAL)	Caribbean Community Climate Change Centre (5Cs), MDAs	In use
The Guidance Tool (G Tool)	CDEMA, ODPEM	In use
The Disaster Catalogue	ODPEM	In use
The Environmental Vulnerability Ranking Index	ODPEM	In use

Table 6.14: Jamaica’s Disaster Risk Reduction Tool Inventory. Source: Created from multiple sources.

6.5 REDUCTION OF UNDERLYING RISK FACTORS

HFA Priority 4 is the reduction of underlying risk factors and includes Environment and Natural Resources Management, Social and Economic Development Practices and Land Use Planning and Other Technical Measures. There are six core indicators related to PFA 4.

1. Priority for Action 4: Core indicator 1

Disaster risk reduction is an integral objective of environment related policies and plans, including for land use natural resource management and adaptation to climate change.

Jamaica benefits from legislation namely, the *National Resource Conservation Act* (1991) and the *Protected Areas Act* which protects natural resources and provides for

delineation of protected areas. Management of some protected areas is carried out by NGOs. Regulatory aspects fall under the remit of the National Environment and Planning Agency (NEPA).

NEPA is charged with the responsibility for regulating environmental and planning matters in Jamaica. In addition there are strong Environmental NGOs which promote sound environmental management practices. There is linkage between DRR and environmental management as hazard impact assessments are required as part of all Environmental Impact Assessments (EIAs) for large projects. The link is less strong at parish level as smaller developments do not necessarily require EIAs as part of the approval process.

The development approval process requires applications to be reviewed by a number of technical agencies including the Mines and Geology Division (MGD), Water Resources Authority (WRA), ODPEM and the National Water Commission (NWA). These agencies include hazard and risk assessments as part of the review process, and can require mitigation measures to be enacted as a condition for approval. These agencies have access to flood, seismic and storm surge hazard maps as well as landslide susceptibility maps.

The situation at parish level is less clear. Parish Disaster Coordinators are not included in the development approval process. However, each Parish Council employs a physical planner who has access to advice from technical agencies. Technical agencies are also included in the parish review applications.

2. Priority for Action 4: Core indicator 2

Social development policies and plans are being implemented to reduce the vulnerability of populations most at risk.

Some social programmes for vulnerable populations exist. The PATH programme which assists poor families with cash assistance for food and for education was launched in 2001 and assists some four hundred thousand (400,000) persons including children from primary to tertiary level, single mothers and the elderly.

All government employees benefit from a non-contributory pension scheme. The NIS also provides benefits for contributors and covers self-employed persons. Contributions are made into a pool by employers and employees until retirement. At age 65 beneficiaries receive a small fortnightly subvention. Death benefits are also available. The Government also manages a contributory Widows and Orphans Fund.

Various disaster preparedness projects have targeted vulnerable populations, such as persons with disabilities, children and the elderly either as discrete projects or as elements of CBDRM projects. There is however, no sustained national programme in disaster risk reduction for vulnerable populations.

Post-disaster assistance in cash or kind is made available for persons earning below the tax threshold. Assistance, in cash or kind, is also made available for small farmers and fisher-folk after disasters, the amounts depending on available resources. After Hurricane Dean in 2007, potential beneficiary families were not provided with Government assistance grants until they could provide evidence of ability to relocate to safer areas. The Parish Councils (local authorities) issued no-build orders in affected high risk zones and there was a strong public education drive to sensitize residents to the benefits of relocating.

Illegal occupation of marginal high risk lands such as river valleys, flood plains, fringes of urban waterways and unstable slopes continues to be a problem. There have been organised post-disaster relocation exercises, but not at a scale which has made a great difference in numbers. The government established a squatter management unit to coordinate a national response to existing informal settlements as well as those which are emerging. A *Homeless Policy* (draft) has also been developed.

3. Priority for Action 4: Core indicator 3

Economic and productive sectoral policies and plans have been implemented to reduce the vulnerability of economic activities

Disaster Risk Reduction is being increasingly included in sectoral planning and programmes. The Agriculture and Tourism sectors which were prioritized under the CDM Strategy have incorporated DRR into their programming, and have identified DRR focal points. The Tourism sector participated in a project coordinated by CDEMA which developed standard procedures for hazard mapping and economic valuation for the sector.

4. Priority for Action 4: Core indicator 4

Planning and management of human settlements incorporate disaster risk reduction elements, including enforcement of building codes.

There is a strong legal and regulatory framework for management of human settlements, including:

- a revised building code currently awaiting passing into law;
- the Town & Country Planning Act;
- the Local Improvements Act;
- the Parish Council's Act; and
- the NRCA Act.

As well as a systemized development approval process which includes the reviewing of applications by technical agencies and ODPEM. The national disaster office considers that substantial achievement has been made in this area, while recognising limitations in key aspects, such as financial and operational capacities.

Investment in DRR for settlements includes planned drainage systems, slope stabilization programmes, relocation to less hazard-prone areas and provision of land in safer areas for low income housing. For infrastructure the NWA is modifying its road and drainage design specifications to take into account the effects of climate change.

A *Hillside Development Policy* (draft) has been developed and circulated for review and discussion; the process includes meeting with local authorities, sectoral interests and community organisations.

Training of artisans in safe building techniques has also been carried out by the national disaster office as part of reconstruction programmes.

Enforcement of the building code and/or building regulations is inconsistent. A major challenge is the number of informal structures which are constructed without approval. Another challenge is the constraint of adequate human resources for monitoring and enforcement.

5. Priority for Action 4: Core indicator 5

Disaster risk reduction measures are integrated into post disaster recovery and rehabilitation processes

The absence of a Recovery and Reconstruction Policy hinders wide-scale and systematic incorporation of DRR into recovery and reconstruction. The ‘Building Back Better’ principle is widely accepted, but the number of actors which take part in reconstruction, especially of human settlements is large and there is no certainty that all the NGOs, CBOs, faith-based organisations and other actors implement mitigation measures as part of their efforts. One positive development is that some local authorities have refused permission for reconstruction in affected areas. Also, following the impact of Hurricane Sandy, there has been public discussion on ‘no-build zones’, some of it in support of the idea.

It should be noted that there is no official requirement for any portion of reconstruction funds to be allocated to risk reduction.

6. Priority for Action 4: Core indicator 6

Procedures are in place to assess the disaster risk impacts of major development projects, especially infrastructure.

Environmental Impact Assessments (EIAs) are required for major projects and those in environmentally sensitive areas, and hazard impact assessments are included in EIAs. In addition all development applications over a prescribed size, must undergo a review by technical agencies, including ODPPEM, which use scientific data on hazards and vulnerability, as well as hazard maps and risk analyses to inform their decisions.

Applications for developments under nine lots are submitted to local authorities for review.

6.6 SUMMARY

The location of Jamaica within the Caribbean Basin and at the northern margin of the Caribbean Plate, increases the exposure of the island to numerous natural hazards as highlighted in Sections 4.1, 6.1 and 6.2. The recent passage of Hurricane Sandy (2012), Dean (2007) and Ivan (2004) highlighted the vulnerability of Jamaica to hurricane effects.

Flooding is the most frequently occurring hazard affecting Jamaica. These events occur as riverine flooding, coastal flooding, inland flooding, flash floods, ponding and to a lesser extent, mud flows. Landslides are also frequent resulting from slope instability caused by a combination of geological, climatic and anthropogenic factors (Smith 2007). Deforestation in hilly/mountainous areas exacerbates the occurrence of landslides. In addition, emerging health related epidemics such as Chikungunya and Ebola should be monitored and effective measures implemented. Although rare, tsunamis have been reported after the 1692 and 1907 earthquakes which caused submarine landslides (Smith 2007; Lander, Whiteside and Lockridge 2002).

Although most of the hazards experienced have been natural, medical, man-made and technological hazards have also affected the island. Small pox, Cholera, Polio, Yellow fever, Malaria and Typhoid as well as Newcastle Disease, Leafspot, Panama Disease, Rust, Citrus Greening, Beet Army Worm, Black Sigatoka and Lethal Yellowing, are reminders of some of the diseases that have and can still affect Jamaica (NDP 1997). Jamaica has also experienced marine, aircraft, railway and road transportation accidents. Road accidents account for the averaged death of 382 persons annually over a 20 year period⁵¹.

Hazards and changes in climate affect the livelihoods of the most vulnerable groups disproportionately. Damage to property and loss of income exacerbate poverty among the most vulnerable groups which include the elderly (persons over 65), disabled and children below 15 years of age. These groups are also highly dependent on the working class and can also be affected indirectly if impacts such as loss of jobs are wide-scale. Various agencies, both public and private, such as the Society for the Blind, Jamaica Association for the Deaf, and the Child Development Agency (CDA) among others have been working with these vulnerable groups. However, there is no specific plan for post-disaster assistance tailored to these groups.

The advent of climate change has brought new challenges for DRR. With drier conditions, increase in the frequency of intense rainfall, longer droughts, sea level rise and more intense hurricanes, small island developing states such as Jamaica will quite

⁵¹ <http://www.nationalroadsafetyCouncil.org.jm/statistics/reports/docs/pdf/CrashStats1991-2011.pdf>

vulnerable to the related risks associated with climate change and climate variability. As such, ongoing efforts should be supported accordingly to reduce risks through the implementation of best practices in all sectors and levels.

Communication Mechanisms

The communication of DRR information is an important factor in achieving resilience. Information relating to DRR/DRM initiatives in Jamaica can be found on a number of platforms including the National Disaster Catalogue and Hazard Database, DesInventar database, and the Caribbean Disaster Information Network (CARDIN). Information on DRR/DRM in Jamaica can also be accessed on the Internet portal of ODPEM, CDEMA, DRRC, PIOJ, Unit for Disaster Studies (UDS) and Regional Disaster Information Center for the Latin America and the Caribbean (CRID) as well as in hard copies at varying agencies and public libraries.

The National Disaster Catalogue and Hazard Database (NDCHD) is a physical database located at ODPEM, which is also responsible for updating the database. The NDCHD contains written records of hazard and disaster events in Jamaica from as early as the 18th century, compiled from historical documents, newspaper reports and technical papers. Generally, the reports are recorded with date, time, location and effects of particular events, although in some cases it is difficult to identify locations. Information on hazards such as floods, landslides, hurricanes, earthquakes and droughts can be accessed from the NDCHD. Efforts were made to incorporate the NDCHD into a web-based platform but online users had difficulties accessing the information.

DesInventar contains an arrangement of datasets which can be analyzed to increase the understanding of disaster trends and their impacts⁵². Information provided on Jamaica by DesInventar accounts for events from 1973 to 2012. ODPEM is currently preparing information based on the datasets required for the updating of DesInventar with more recent information. It should be noted that DesInventar does not provide written reports or assessments but rather quantitative data on particular events and the affected population. The section on Jamaica contains very little quantitative data on damage and losses for local level events i.e. events at the parish and community level.

CARDIN was developed in 1999 and has since been fulfilling its role as a virtual library platform for regional data. Unlike DesInventar, CARDIN provides information in the form of reports (including post disaster assessments), presentations, manuals, scholarly articles and maps. The main priority of CARDIN is the dissemination of disaster related information on the Caribbean and individual countries⁵³. CARDIN is currently being hosted by the University of the West Indies (UWI) which is responsible for the updating and maintenance of the database for the virtual library. Several agencies/organisations and desktop research have provided much of the information for the platform of CARDIN. However, the database is not being upgraded as required due to lack of financial support and information sharing from the key stakeholders.

⁵² http://www.desinventar.net/what_is.html

⁵³ <http://www.mona.uwi.edu/cardin/about.asp>

Lessons Learnt

DRR Good Practices

A number of lessons and good practices from hazard events impacting Jamaica, as well as those affecting other countries have been adopted. Jamaica was a rarity in including a mitigation branch in its organisational structure from its inception, and historically ODPEM has coordinated several mitigation initiatives. Over the past two decades more emphasis has been placed on the integration of hazard impact assessments and risk reduction measures into DRM programming and physical and economic planning. However efforts are constrained by inadequate resources, competing priorities and inconsistent budgetary support.

Poverty Reduction Initiatives

A number of poverty reduction projects and initiatives have been established to reduce disaster impacts and environmental degradation which can exacerbate disaster impacts. Public awareness programmes and campaigns have also played a vital role in changing the attitude of selected groups towards natural hazards and disaster risks. In addition, education and training for DRR promoted by various sectors through integration into existing programmes.

Land-use Planning

Focus on land use planning saw the creation of medium term developments plans in the 1940s which had a predominant economic focus. The *National Physical Plan* (NPP) for Jamaica (1970-1990) attempted to address the need for spatial planning and long term national development planning. Owing to the inadequacies of the first document, the existing NPP (1978-1998) was developed in a more comprehensive manner. The NPP was designed with the *National Settlement Strategy* (NSS) which aimed to achieve better balance among social, economic and physical development across Jamaica (NEPA 2011).

Challenges with the *National Physical Plan* (NPP) include relatively short planning horizons, inadequate systems to support implementation, weak synergies between objectives, strategies and budgets along with the absence of targets, indicators, monitoring and evaluation framework (NEPA 2011). There is need for future planning and updating of the NPP as there is increasing pressure on coastal zones, limited land resources and climate change to be considered. The *National Spatial Plan* (NSP) (draft) done by OPM and NEPA seeks to address spatial planning issues and guiding principles needed for sustainable development at the national and regional level. It is important to note that the NSP and *Vision 2030 Jamaica* share similar goals and priorities especially in the area of sustainable urban and rural development (NEPA 2011).

Challenges

There are a number of challenges which hinder coordination and the sharing of experiences for environmental management, disaster risk reduction and adaptation to climate change. One of the major challenges is the lack of local government systems to support and sustain the existing efforts at national level and to institutionalize the inclusion of the use of hazard information into the planning process and improving the

disaster emergency event registry (ODPEM 2011). In addition, gaps evident in communication with key ministries and agencies such as (but not limited to) the Ministry of Health and the NWA affected coordination and efforts geared at reducing disaster related risks.

Personnel are important and play a vital role in DRR in the various agencies and organisations. ODPEM notes that communication with liaison persons within the ministries and organisations can be challenging at times due to changes in personnel especially during post-disaster situations (ODPEM 2013). It is also important that DRR/DRM is included in public sector job descriptions which denote some amount of responsibility among individuals.

Support from Technical and Scientific Institutions

Technical and scientific institutions and local universities have made progress in monitoring hazards in Jamaica. The Meteorological Services of Jamaica, WRA, CSGM, MGI, MDG, Earthquake Unit and the Caribbean Institute for Meteorology and Hydrology (CIMH) among others, have done extensive research on hazards including floods, droughts, tropical cyclones, landslides and earthquakes. The Meteorological Services of Jamaica uses Doppler radar and satellite images to support their forecasting capabilities. CIMH produces quarterly reports on rainfall and drought outlooks for the region, and the Meteorological Services of Jamaica will be producing such outlooks on a national level.

The CSGM and CCCCC have played a vital role in downscaling global climate change models and creating frameworks and actions plans necessary to combat the effects of climate change. These efforts have resulted in drought, rainfall and sea-level rise forecasting which can help in effective planning. The WRA has produced flood hazard maps and established a number of flood early warning systems in watersheds to reduce the risk of flooding.

The Earthquake Unit (UWI) continues to conduct research on identifying active faults in order to monitor those faults for potentially large earthquakes. Research is being conducted in Kingston Harbour to identify submarine faults which could increase the vulnerability of critical infrastructure located in Kingston or along the Kingston Harbour. The Earthquake Unit is also responsible for the operation, monitoring and maintenance of the Jamaica Seismograph Network, which identifies, measures and locates inland and offshore earthquakes.

Jamaica, a member of the *Adjacent Regions Tsunami and Other Coastal Hazards Early Warning System*, receives tsunami warnings from the Pacific Tsunami Warning Centre after major earthquake events. There is a regional project to develop a Caribbean Tsunami Early Warning System. A simulated test of the system was carried out in the community of Old Harbour, St. Catherine in February 2012. A number of stakeholders were included in the simulation such as the community members, ODPEM, Fire Brigade, JDF, Police and Red Cross among others. A number of challenges were identified and will be addressed for future simulations.

The post disaster recovery process is coordinated by the PIOJ (the government economic planning arm) and ODPEM. While the concept of *'building back better'* is widely accepted by most agencies that function in the recovery phase, the absence of a Comprehensive Recovery Plan and a policy for post disaster replacement housing highlight additional gaps at the national level. 'No Build' Orders in affected communities have in instances been carried out by some Local Authorities to ensure that areas such as wetlands remain uninhabited. ODPEM reports that since Hurricane Dean in 2007, five coastal communities have been identified where their most vulnerable populations will be relocated in an effort to ensure that persons do not return to reside in the affected areas. Some NGOs and the national disaster office have included basic risk reduction measures in the rebuilding of homes and have trained community level personnel in safer building practices.

The *National Progress Report* (ODPEM 2011) concluded that systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery programmes and in the reconstruction of affected communities is done. The capacity of Local Governance systems remains inadequate; however over the next 3 years, mechanisms for harnessing skills at the community level will be improved. The national disaster office will expand its programme of building community resilience by strengthening its volunteer programme and the partnerships between state and non-state actors in an attempt to build national resilience and establish a culture of safety in Jamaica.

There is a lack of sex disaggregated data on vulnerability and DRM in Jamaica. Data collection instruments used by Government and NGOs among others do not often facilitate this, thereby leaving women 'invisible' in disasters in Jamaica. Poverty, lack of education and unemployment have increased women's vulnerability in Jamaica in fact it was suggested that poverty in Jamaica was feminised (Senior and Dunn 2009). Female headed households continue to be vulnerable. Women continue to lose ground in the workforce as many remain unemployed and unable to adequately care for their families including children who become vulnerable due to parental circumstance. Although there have been studies carried out and programmes put in place to govern treatment of children in disasters many children continue to be affected by disasters.

The elderly, the disabled, persons living in vulnerable areas, be it on the coasts or on unstable slopes, continue to be affected when there is a disaster in Jamaica because adequate measures are not always in place and enforcement of existing laws is not carried out. In addition, there is inadequate funding and/or lack of institutional capacity among the key stakeholders.

Vulnerability remains a serious issue in Jamaica. Not only vulnerable populations are at risk; but also infrastructure-roads, buildings, water supplies, the food chain, come under serious threat. However, the construction of the new Dry River Bridge in Harbour View (Plate 6.10 and 6.11) to withstand flood impact from a 100-years flood event is a step in

the right direction⁵⁴. Projects implemented by NWA in White Horses in St. Thomas, Bog Walk in St. Catherine and Rio Grande in Portland, which incorporate climate change adaptation measures, can also be commended. Although there are some achievements, Jamaica's vulnerable populations continue to be vulnerable because many achievements may be made under projects, which are not sustained.



Plate 6.10: Replacement of the Harbour View Bridge, St. Andrew. The original bridge was severely damaged during tropical storm Gustav. Source: NWA 2010.



Plate 6.11: Post-construction phase of the bridge at Harbour View, St. Andrew. Source: OPM 2011.

Despite some progress, there continues to be weaknesses in how Jamaica tackles issues of vulnerability at all levels of the society, due in part to the number of actors engaged in finding solutions to problems, as well as uncoordinated projects. Efforts need to be complementary and mutually beneficial at all levels and undertaken within a guiding framework which ensures synergy. For example improvements in how shelters are built,

⁵⁴http://www.jis.gov.jm/news/archive/23339-trans_works-contract-signed-for-reconstruction-of-harbour-view-bridge

organised and managed are needed. Schools used as shelters often are not disabled-accessible, and there is not enough shelter staff to adequately assist persons needing special care. Programmes and projects need to be targeted to specific groups be they women, the visually impaired, the physically disabled or persons living in vulnerable communities, and these programmes should include planning for crises and emergencies.

The national strategies identified previously require collaboration and team work and the pooling of Jamaica's limited resources. The large number of players responsible for DRR in the country cuts across constituencies, ministries and sectors. All the major Government agencies have been identified as having a role to play in accomplishing the national strategies identified. The challenge will be to coordinate activities in order to eliminate duplication of efforts, and to achieve data management and sharing, and continuity. The level of interaction and collaboration may be challenging due to limited resources both human and capital. Considering that the objectives to be reached can be daunting in any society, Jamaica having been severely affected by the global recession, increasing poverty, unemployment, vulnerable population and issues of health will continue to grapple with issues of capacity within its resource constraints.

The *National Progress Report* (ODPEM 2011) states that capacity development in DRR in Jamaica is not only lacking at the national, parish and community levels but also in all sectors, except tourism and agriculture. Through *Vision 2030 Jamaica* and other initiatives there is commitment to address this issue. Despite lack of adequate resources human, financial, technical, operational, etc., capacity building through training, programmes, projects and workshops continues to remain in focus. So far most of the three (3) year goals have not been met because of resource constraints. Jamaica's biggest challenge seems to be lack of financial resources.

Capacity building at all levels including the institutional and community levels remains a challenge (ODPEM 2011). There are however, other areas including identification of hazards and elements at risk, which, if solved, will lead to the strengthening of national and local preparedness programmes and early warning systems.

There is a commitment to use legislation and hazard-identification in areas that have not yet been mapped in order to prioritise areas for capacity building. There will also be a capacity building programme in DRR for all local planning authorities, institutions and communities (ODPEM 2011).

Additionally, the capacity of local government systems in DRR will be improved to include the use of hazard information in the planning process and the improvement of the disaster or emergency registry.

7.0 DISASTER RISK ANALYSIS OF THE COUNTRY

7.1 METHODOLOGY

In 2005 the IDB developed a system of indicators to measure risk and vulnerability using indicators at the national level for the Latin American and Caribbean region. It was felt that DRM should be comprehensive in its assessment and should therefore include a wide range of factors including expected physical damage, victims, economic loss, social and organisational and institutional impacts. The IDB felt that most techniques did not address the issue of risk which was important in assessing vulnerability and devising an effective DRM strategy (IDB 2007).

The system of indicators had a number of objectives, namely, improved use and presentation of risk information; providing a measurement tool for elements of vulnerability to natural hazards; and use of the methodology would promote the exchange of technical information in the formulation of public policy and risk management programmes in Latin America and the Caribbean at the national level including Jamaica (IDB 2007; IDB 2010).

The indicators proposed are transparent, easy to periodically update and easily understood by policy makers. Four (4) indicators represent the main elements of vulnerability and also highlight each countries progress in managing risks (IDB 2007). The four indicators (IDB 2007; IDB 2010) are listed below.

1. The Disaster Deficit Index (DDI)

This index measures the country's risk from a macroeconomic and financial point of view according to possible catastrophic events. The DDI requires the estimation of critical impacts during a given period of exposure, as well as the country's financial ability to cope afterwards. It relies on scientific predictions.

2. The Local Disaster Index (LDI)

This index identifies the social and environmental risks resulting from what are considered recurrent lower level events (which are often chronic at the local and sub-national levels). These events have a disproportionate impact on more socially and economically vulnerable populations, and have highly damaging impacts on national development. It relies on historical data.

3. The Prevalent Vulnerability Index (PVI)

This index is made up of a series of indicators that characterize the country's prevalent vulnerability conditions which are reflected in the exposure prone areas, socioeconomic weaknesses and lack of social resilience in general. The index relies on aggregate scores of quantitative and qualitative indicators.

4. The Risk Management Index (RMI)

This index brings together a group of indicators that measure a country's risk management performance. These indicators reflect the country's organisational, development, capacity and institutional actions taken to reduce vulnerability and losses, to prepare for crisis and to recover efficiently and effectively from disasters. The index relies on aggregate scores of quantitative and qualitative indicators.

The system of indicators covers different areas of the risk problem, including:

1. potential damage and losses resulting from extreme events;
2. recurrent disasters or losses;
3. social and environmental conditions that make particular countries or regions more
4. disaster prone;
5. the capacity of the economy to recover;
6. the operation of key services; institutional capacity and the effectiveness of basic risk management instruments (such as risk identification, prevention and mitigation measures, financial mechanisms and risk transfer);
7. emergency response levels; and
8. preparedness and recovery capacity (IDB 2007).

This system of indicators has been designed to:

1. permit measurement and monitoring over time
2. identify risks and their causes and to facilitate comparisons across countries by using criteria related to hazard levels and the socioeconomic conditions that affect vulnerability.
3. provide a holistic approach to evaluation that is also flexible and compatible with other evaluation methods.

The indicators main advantage is in the ability to disaggregate results and to identify factors that should take priority in risk management actions, while at the same time measuring the effectiveness of those actions. The main objective is to facilitate the decision-making process (IDB 2007; IDB 2010).

Risk Analyses for Three Towns

In 2011, risk assessments and risk management plans were completed for Savanna-la-Mar, Black River and Ocho Rios (SWI 2011). The risk profiles developed were based on assessing the vulnerability of community assets to multiple hazards and estimating the level of damage which would be suffered by the assets and then applying a monetary value to the damage. The method used involved:

1. Development of multi hazard maps for the towns for flood, storm surge, earthquakes, wind and landslides
2. Identifying critical facilities, critical infrastructure and economic centres
3. Identifying elements at high risk to the hazards identified
4. Assessing the vulnerability of the elements at risk

5. Assessing the potential damage from a catastrophic event
6. Monetising the potential losses as a percentage of total replacement cost

One hundred per cent replacement cost was used as a proxy for severe structural damages. The study also identified environmental assets, which are vulnerable to the impact of natural and man-made hazards. Table 7.1 shows the potential losses from natural hazard events in the three towns.

LOCATION	FLOOD1 in 100yr event	STORM SURGE 100 year event	EARTHQUAKE 50 year event	LANDSLIDE	WIND 150 year event
Ocho Rios	J\$624.7m	J\$141m	J\$20.7b	Not Given	J\$2.06b
Black River	J\$34.2m	J\$34.2	J\$513m	Not applicable	J\$171m
Sav La Mar	J\$42.5	J\$127.5	J\$637.5m	Not applicable	J\$212.5

Table 7.1: Potential Losses from Selected Events, Ocho Rios, Sav-La-Mar and Black River. Source: SWI 2011.

The Caribbean Risk Atlas

This project was coordinated by the Institute for Sustainable Development (ISD) and DRRC, UWI and included flood risk analysis for the Hope River, Kingston and seismic risk analysis for Kingston. The outputs have been uploaded to a website to which the public will have access; however data entry is not yet complete. This project sought to address two problems associated with past hazard mapping and risk analysis projects. The first, use of proprietary software requiring recurrent outlay of money for licensing fees, was overcome by using open-source software. The second, keeping hazard maps updated, will be solved by giving all technical agencies access to the Risk Atlas website, allowing agencies to enter new data and update maps periodically.

7.2 DEFINITION OF RISK SCENARIOS

Scenarios, which have been created for Jamaica, have been drafted for simulation exercises, which are conducted to increase preparedness and build capacity for response and initial recovery operations. In order to achieve consensus on the definition of risk scenarios, a stakeholder consultation was organized in 2012. The results from that consultation informed this section of the report.

Risk scenarios can be used for all aspects of disaster risk management. For preparedness it allows planning for the level and type of resources required, where they should be located, type of training needed for response teams, the type of public awareness required. The scenarios can also be used for simulation exercises as is presently done.

For risk reduction, scenarios can be used to help decide on location of lifeline systems, and evacuation routes. Results from hazard mapping and risk analysis can inform building codes and zoning laws and regulations, as well as structural designs and physical and macro-economic planning.

In the response phase scenarios allow projections of impact, casualties, damage to the built environment including critical facilities, as well as damage to the natural environment.

For the recovery phase, economic rebuilding, rehabilitation and relocation planning can all be informed by disaster risk scenarios.

Gaps

In discussing the need for scenario development some gaps were identified which must be seen as priorities to be addressed in support of development of the disaster risk scenarios:-

1. Lack of detailed building inventories – There is some building inventory data in private hands, and the recent Caribbean Risk Atlas project collected detailed data on buildings in areas of Kingston
2. Lack of specific damage data for buildings types
3. Lack of detailed information on value of buildings – There is no comprehensive inventory on value of buildings. It may be possible to derive some of this data from the insurance sector.
4. Lack of data on value of natural resources, agriculture resources, government assets and infrastructure.
5. Lack of standardised methods – there should be a national consensus on the method to be used.

Priorities

Priorities for disaster risk scenarios were identified as:

Priority 1: Earthquakes and secondary hazards – Magnitude 7.5 originating on the Plantain Garden Fault and Magnitude 6.5 with epicentre near Montego Bay. These would provide information on the probable impact of large earthquakes on the capital and second city.

Priority 2: A Category 5 hurricane traversing east – west across the island. This is or is close to a worst case scenario for a hurricane affecting Jamaica. It is modeled on Hurricane Gilbert which affected the country as a Category 3 hurricane.

Priority 3: a) The 150 year flood in a location to be decided and b) prolonged drought affecting the entire island. This scenario is based on the anticipation of the effects of climate change.

Priority 4: Hazardous materials release in the Kingston Harbour zone and populated areas. There have been a number of small releases in 2012. Greater attention is to be paid to technological hazards.

Priority 5: a) Pandemics such as influenza, Ebola, Chikungunya and b) disease in the banana, citrus, sugar and poultry industries. National simulation exercises have been run for influenza, but not for diseases affecting agriculture. As food security considerations and pest diseases are projected to become increasingly important because of climate change, this gap should be addressed.

Next Steps

The following were identified at next steps:

1. Ownership of the process of developing, updating and implementing disaster risk scenarios is to be decided.
2. The target time frame for completing the scenarios is to be decided.
3. Standardised methods for developing risk scenarios are to be developed.
4. A source of funding is to be identified.
5. A training programme is to be developed for the stakeholders who would be involved in development of the scenarios.

It was unanimously agreed that local knowledge from communities should be included in the scenarios.

Note: No further work has been done on risk scenarios (2014).

7.3 SUMMARY

Information on hazards has become increasingly available thanks to the use of technology aids such as websites and social media sites. There is challenge in reaching rural areas where there is no internet service, although CBDRM programmes help to disseminate information on preparedness and planning. Access to products which would help in educating the public about risk reduction, such as hazard maps is more restricted. It should be noted too, that availability and use of hazard maps at parish level is inconsistent, and many maps are outdated. The approach by the UWI in making the outputs of the Caribbean Risk Atlas available on the internet for consultation and updating should be an example for future projects.

The projected impact of sea level rise on Caribbean countries has been calculated for scenarios of one and two metre rises in sea level (Caribsave 2010). For Jamaica, a one metre rise in sea-level will affect 1 per cent of agricultural land, 8 per cent of major tourism resorts, 20 per cent of airports, 2 per cent of the road network and 100 per cent of

port lands. For a two meter rise, 2 per cent of agricultural land, 18 per cent of tourism resorts, 60 per cent of airports and 80 per cent of power plants would be affected. Other scenarios to be considered is the superimposing of storm surge on sea level rise. Modelling from the Caribsave project suggests surges of up to 5m in such a scenario. It should be noted however, that storm surge of greater than 5m has been recorded, in Hurricane Allen, for example. The level of storm surge inundation is dependent on bathymetry, coastal topography as well characteristics of the approaching hurricane. The scenario projects damage for 38 per cent of major tourism resorts which has grave implications for the economy. Damage to the coastline and beaches will also be severe.

Calculation of DRM indices (IDB 2008) showed that there was some progress made since 2005, though not in all areas:

1. The risk identification index showed improvements in public information and community participation with an advance from significant to outstanding.
2. Vulnerability and risk assessment and training and education in risk management showed improvement from incipient to significant.

For risk reduction the review notes that there were no advances in the majority of activities except reinforcement and retrofitting of assets which moved from low to incipient. Disaster management showed a slight improvement in availability of equipment and rehabilitation and reconstruction planning, while coordination of emergency operations changed from optimal to outstanding (IDB 2008).

One of the advantages of this system of indices is that they can be disaggregated and progress in a number of sub-areas can be measured and tracked. In 2005-2007 work was done to established baseline conditions against which progress can be measured, as was done in 2008.

8. STRATEGIC DIRECTIONS FOR DISASTER RISK REDUCTION IN THE COUNTRY

Long term DRR strategic priorities and strategies for achieving them are stated in *Vision 2030 Jamaica*. In discussions with public sector stakeholders, the consensus was that these priorities are still relevant. The *National Work Programme Results Framework 2011 – 2014*, coordinated by ODPEM, lists four Outcomes designed to achieve the impact of ‘increased resilience of Jamaica to hazards’. The work programme is developed within the Comprehensive Disaster Management framework agreed to by all CARICOM states, and is consistent with the priorities of the Hyogo Framework for Action.

National Work Programme Outcomes:

1. Outcome 1 – Enhanced community capacity to mitigate and respond to the adverse effects of climate change and disasters.
2. Outcome 2 – Disaster Risk Management mainstreamed at national and Parish levels and incorporated into key sectors.
3. Outcome 3 - Disaster Risk Management information utilised to build a culture of safety at all levels
4. Outcome 4 - Preparedness, Mitigation, Response and Recovery Systems Strengthened.

A Performance Measuring Framework, with indicators was developed for monitoring progress of the work programme, however much of the baseline data has not yet been collected.

The Work Programme Results Framework Outcomes are compatible with the priorities of Vision 2030 Jamaica and are mapped in Table 8.1.

NATIONAL STRATEGIES Vision 2030	WORK PROGRAMME OUTCOMES - ODPEM
Improve resilience to all forms of hazards	Disaster Risk Management mainstreamed at national and parish levels and incorporated into key sectors.
Improve emergency response capability	Preparedness, mitigation response and recovery systems strengthened
Develop measures to adapt to climate change	Enhanced community capacity to mitigate and respond to the adverse effects of climate change and disasters
Contribute to the effort to reduce the global rate of climate change	Disaster risk management information utilised to build a culture of safety at all levels

Table 8.1: Work Programme Outcomes and National Strategies. Source: SWI 2011; PIOJ 2009a.

8.1 PRIORITIES AND STRATEGIES FOR INTERVENTION

During the updating exercise, stakeholders recommended that strategies identified under *Vision 2030 Jamaica* should be maintained for continuity. The priorities and list of strategies indicated are summarized below. The complete table is given at Appendix 2:

Priority Area: Drivers of risk - HIGH PRIORITY

The drivers of risk include:

1. Environmental degradation increases the exposure of the population but management methods are being applied.

Strategy: There needs to be a higher level of investment in environmental management and DRR.

2. Socio-economic indicators are predominantly low in exposed populations.

Strategy: Conduct critical facilities audit programme and a national critical infrastructure rehabilitation, hardening and relocation programme.

3. There is a high and increasing occupation of urban areas at risk (over 30 per cent of the population of the analysis area) with inadequate control over the implementation of the urban and rural land use planning.

Strategy: Establish measures to incorporate hazard risk reduction in land-use practices and human settlements.

Priority Area: Historical records of hazards, exposure and disasters - MEDIUM PRIORITY

Indicators for historical records of hazards, exposure and disasters include:

1. There are areas with recurring events, and there are records of previous impacts that have caused damage and losses; there is multi-hazard mapping and/or forecasts based on probabilistic criteria, but some of this information is outdated. An expert assessment is required to determine current conditions.

Strategy: Create a national framework for regular updating of hazard and risk maps and relevant data.

2. Existing information but without territorially disaggregated information on the impact of disasters. The existence of this type of information is essential to improve the quality of decision-making.

Strategy: Expand community level data collection across the island.

3. There are clearly identified hazards (hurricanes, floods in major basins, droughts, earthquakes and others), as well as risk scenarios including the impacts of climate

change, but there is need for more plans and risk scenarios that respond to the identified hazards and studies.

Strategy: Increase use of probabilistic risk assessment tools.

4. The population without access to essential services⁵⁵ is between 20 per cent and 50 per cent of the population in areas exposed to hazards. Essential services are vulnerable and exposed to the identified hazards, but actions are being developed for their management.

Strategy: Develop institutional capacity to prepare for and respond to multiple hazards.

5. There are enabling regulations for risk management (safe and orderly use and occupancy of urban and rural territory, protection and management of watersheds, slopes, ecosystems and environment, building and planning codes to reduce risks), but low implementation. Formal accountability mechanisms by State agencies are not adequately enforced for risk management and environmental management.

Strategy: Continue to modernise the legal framework related to hazard risk reduction.

Priority Area: Current Risk Management Capacities - MEDIUM PRIORITY

Indicators for current risk management capabilities include:

1. Institutional response structures are present but some lack plans, and their capacity is limited due to resource constraints. Certain institutions are not fully integrated into the system. Community and institutional preparedness for emergencies and/or disasters exist in some institutions and communities.

Strategy: Develop and implement plans for anthropogenic hazards.

2. Coordination mechanisms of local governments are in place but do not fully integrate DRM and Environmental Management among their priorities.

Strategy: Ensure that key stakeholders, especially those at the local level, are included in the development and implementation of national disaster plans, parish disaster plans and community disaster plans.

3. There are legal frameworks in place that enable the allocation or reallocation of resources once a disaster or emergency has occurred but there is limited funding for preparedness; access to resources is not streamlined or administrative processes are inadequate or ineffective.

⁵⁵ Essential services include but not limited to water, sanitation, health, communication, etc.

Strategy: Mainstream DRM into related plans and budgets at sectoral level.

4. There are early warning and hazard monitoring system(s) in place, however some vulnerable groups such as the deaf and hearing impaired are excluded, and monitoring and warning systems need to be expanded to all hazards.

Strategy: Build adequate emergency response capability including early warning systems.

Priority Area: Enabling Regulations - MEDIUM PRIORITY

Indicators for enabling regulations include:

1. Regulations and legal instruments exist for DRM, consistent with national and international legal frameworks, but they are not effectively implemented or monitored.

Strategy: Modernise the legal and institutional frameworks related to hazard risk reduction.

2. There are inter-agency structures linked to form a coordination and participation system but its activation, capacity and work are limited.

Strategy: Identify gaps and foster greater collaboration between Ministries, Departments and Agencies, and other key stakeholders at all levels to improve coordination and decision making.

3. There are some sectoral institutions with internally assigned Risk Management responsibilities and specific planning but there are limits in terms of DRM as a comprehensive process integrated into territorial development.

Strategy: Establish Country Risk Officers within public offices.

Priority Area: Trends and Future Prospects - MEDIUM PRIORITY

Indicators for trends and future prospects include:

1. There are scenarios about the impacts of climate change, but they are not fully coordinated or integrated into the risk management strategies at all levels.

Strategy: Create mechanisms to fully consider the impacts of climate change and ‘climate proof’ all national and sectoral policies and plans.

2. There are mechanisms for risk trend analysis, but they are not adequately linked to the development analysis and planning process.

Strategy: Integrate risk trend analysis into policies relating to planning, development, disaster risk management and climate change adaptation.

Priority Area: Enabling regulations - LOW PRIORITY

Indicators for enabling regulations include:

1. Advanced level of decentralization including the responsibilities of sub-national governments in risk management but limited in terms of implementation and the allocation of resources.

Strategy: Modernization of the local government system in Jamaica to enable local authorities to be more effective in all aspects of the disaster management cycle.

8.2 DISCUSSION

Disaster risk is a function of the probability of occurrence of a hazard, and vulnerability to that hazard. Risk can be reduced by reducing the probability of occurrence of the hazard and/or reducing vulnerability. Technological hazards are more susceptible to successful prevention interventions. It is possible, for example, to prevent hazardous materials leaks and spills.

Since it is virtually impossible to reduce the probability of occurrence of most natural hazards, reducing vulnerability represents the best approach to reducing risk from these hazards.

Hazard Analysis

Historically, the approach to reducing risk in Jamaica has been more focussed on the study of hazards and introduction of mitigation measures in order to reduce the impact of these hazards. Very little work has been done in Jamaica in measuring and addressing vulnerability. At national scale, the use of vulnerability indices has been mentioned, as well as the ranking index used by ODPEM and sporadic use of the CVAT method. However there is no systematic coordinated effort to research and understand the drivers of vulnerability in order to ensure systematic reduction of vulnerability. In addition, although the existence of vulnerable populations – the elderly, female-headed households (FHH), persons with disabilities, elderly without pensions, is recognised, many disaster plans do not include procedures for these populations.

Enabling Framework

In order for DRR gains to be made, there must be an enabling framework. In this regard there are some encouraging signs of progress. Mention has already been made of the national development plan, *Vision 2030 Jamaica* which provides the national enabling framework for DRR. This is supported by the National Hazard Risk Reduction Policy. The Integrated Disaster Risk Management Action Plan, now being finalized, will operationalize DRR for the country, providing a road map by which DRR multi-sector initiatives can be pursued. In addition DRR is given priority during the GOJ budget process by a system of points in which DRR related projects, or projects including DRR, score more points thus giving them priority in the budget allocation process. The

integration of DRR and CCA in projects and programmes is also a positive step. Despite the progress which has been made, there are gaps which must be addressed related to systematic inclusion of DRR in all planning, including macro-economic planning.

Risk Analysis

There has been no comprehensive multi-hazard risk analysis for Jamaica. In order to carry out such an assessment there is need for detailed information on exposure, vulnerability and hazards. The country lacks such detailed data bases. The most comprehensive risk analysis to date is the 2009 Catastrophe Risk Profile which calculates Probable Maximum Loss and Average Annual Loss for hurricanes and earthquakes.

The authors of that study pointed out that because of data constraints, in most cases proxies are developed using indirect variables and correlations. For example there is inadequate data for building status and value, two elements which are critical to calculating the level of damage a building will sustain from a particular event, and the cost of that damage. In the case of public services and infrastructure where unit values are not available the authors used typical values from other countries in the region for the calculations.

Further limitations are introduced when the hazard profiles are calculated. For example, the data used for calculation of seismicity was obtained in the late 1990s and as stated by the authors, 'the effects of local seismic response are not taken into account'. Despite the constraints this study provides important information. It is the first time that a probabilistic risk assessment was done for Jamaica. Importantly the assessment includes national and parish levels, thus covering the entire country. The total exposure for earthquakes and hurricanes is 18.65 billion US dollars (IDB 2010). It must be noted that the exposure to flooding as a result of hurricanes or intense rainfall is not included in the analysis, so this figure must be viewed as being conservative.

The study represents the most comprehensive set of data on risk. Its utility is increased as the risk is expressed by geographical units – parishes - as well as by sector, and is aggregated at national level. This data is particularly useful to the GOJ in guiding its risk transfer and investment policies.

Integration of DRR into physical planning has made improvements with inclusion of technical agencies in the development approval process. The process requires all major developments to be reviewed by technical agencies at national level. Capacity for technical review at parish level is limited, however, and many parishes do not have hazard maps, vulnerability assessments or risk analyses to guide decision making.

Sectoral Integration

At the sectoral level, the Tourism Ministry participated in a regional project on developing a hazard mapping standard for the tourism sector. The project also included establishment of plans for emergency operations centres for the tourism industry and integration of the sector's plans into parish and national plans. The Ministry of

Agriculture has also included DRM in its work programme which includes development of the national ADRM plan and inclusion of DRM and CCA in several projects aimed at supporting sustainable livelihoods for small farmers.

Integration of Disaster Risk Reduction in Natural Resource Management is achieved mainly through the inclusion of hazard impact analyses in EIAs. Impact of disasters on natural systems is included in post-impact assessments which use the ECLAC assessment method. Degradation of natural systems through development and overuse of resources, however, continues to be a challenge. Over the last three years there has been training of the public sector in natural resource valuation. This is also included in the MSc Natural Resource Management Degree at UWI, Mona campus. Both these initiatives should, over time, lead to a cadre of technical personnel who can effectively lead the process of better integrating DRR in natural resource management. The role of ecosystems in reducing the impact from natural hazards has been recognised and rehabilitation of natural systems has been included in some projects related to DRR and CCA, for example.

All examples of risk assessments shown here are the result of projects funded by donor partners. Government and municipal agencies do not have adequate budgets to undertake a systematic programme of hazard mapping, vulnerability assessment and risk analysis. There are several negative aspects to this resource constraint. Existing hazard maps are outdated and do not reflect latest scientific or population and development data. Risk analyses based on these maps are therefore likely to be inaccurate. This must be recognised in the use of the maps and in any derivations from the maps.

Standardisation of Methods and Data Management

There is no standard approach to either hazard mapping or risk analysis, making any attempt at comparisons across time futile. Since there is no national hazard mapping programme, there has been no agreed prioritization of areas to be mapped. There are therefore gaps in information for areas which could be considered critical. For example despite having suffered a recent damaging earthquake in 1957, no detailed seismic study of Montego Bay, the second largest city, has been done.

Another noticeable gap is that some methods for climate-related hazard assessment such as flooding and storm surge are based exclusively on historical data and do not factor climate variability and climate change in the analyses. Analysis of climatic data suggests that use of historical data does not adequately account for variations being experienced in rainfall (Carby et al. 2012).

Management of Emerging Threats - Diseases

The CHIKV outbreak in Jamaica, and the threat posed by the Ebola cases in the USA as well as the outbreaks in West Africa brought the topic of epidemics into sharp focus in the latter half of 2014. Although not yet fully quantified, it is clear that the CHIKV outbreak will negatively affect the economy. The head of the Private Sector Organisation of Jamaica (PSOJ) estimated that some 13 million man-hours have been lost as at October 15 (Collinder 2014), translating to an estimated dollar value of J\$6 billion dollars

lost from production. The Jamaica Manufacturer’s Association estimated from their survey among members, that sick workers were absent from work for an average of four days. Reports of infection rates varied from 40-60 per cent among businesses (Collinder 2014).

There are a number of secondary effects which have not been factored into estimates of loss. In addition to loss of work time of affected persons, further productive time was lost as family members had to remain at home to care for ill relatives. Many persons report that pains and extreme fatigue continue for weeks to months after initial recovery, this will further reduce productivity. Hospitals and other health facilities were placed under severe pressure by the load of CHIKV patients coupled with sickness among health staff. The Health Centre at the UWI, for example, cancelled all appointments for a period of weeks while staff struggled to manage CHIKV cases. There are media reports of deaths seemingly related to complications from CHIKV infection. The elderly and persons with underlying medical conditions seemed to have been the most vulnerable.

The CHIKV outbreak illustrated the importance of good sanitation and waste management practices in prevention. Inadequate vector control and clean-up of stagnant water as well as solid waste were factors in the spread of the disease. Prior to the rainy season, the National Solid Waste Management Agency (NSWMA) had reported severe difficulty in carrying out its normal schedule of garbage collection. There was therefore a back-log in collection. In addition, inadequate cleaning of urban waterways and drains resulted in pools of stagnant water which became breeding sites for mosquitoes. Additional funding for CHIKV prevention and response were not allocated until September-October, well after the outbreak started. Eventually J\$500 million was allocated for CHIKV response as highlighted in the Table 8.2 below:

Responsible Entities/Related Activities	Allocated Amount (\$ JMD)
Parish Councils	70 million (\$5 million per parish)
Member of Parliament Constituencies	126 million (2 million per constituency)
Ministry of Health (emergency needs)	150 million
For additional vector control and clean-up	154 million
Sub-total	497 million
NSWMA – solid waste management	131 million*
Total	628 million

Table 8.2: CHIKV response after NDC meeting. NB. * refers to allocation from the Consolidated Fund. Source: JIS 2014⁵⁶.

Planning for any future Ebola cases is underway, including establishment of two isolation centres, one each in Kingston and Montego Bay. Training of health personnel and public awareness are on-going. The GOJ has sought help from PAHO, Cuba and other sources in order to ensure an adequate response.

⁵⁶<http://jis.gov.jm/chikv-cleanup-allocations-clarified/>

8.3 SUMMARY

The long term goals for disaster risk reduction and the strategies for achieving them are articulated in the country's long term development plan. This is a key factor in integrating DRR into national development planning and demonstrates the government's recognition of the importance of DRR to national sustainable development. The national work programme developed by ODPEM is a consensus document, written with the input of key stakeholders and taking into account *Vision 2030 Jamaica*, the Regional CDM Strategy and the HFA, all of which *emphasise* the importance of DRR to sustainable development. This approach should ensure that elements of DRR are incorporated into the work plans of government entities – an important step if DRR is to be achieved.

The fact that this ideal situation does not necessarily translate into reality was clearly demonstrated by the response to the CHIKV outbreak, when funding for clean-up, vector control and sensitization of the public was allocated well after the start of the outbreak, rather than before the onset of the rainy season when breeding of mosquitoes could have been reduced. Carby (2014) posits that more benefit would have been derived had this approach been taken, quoting a study on Dengue in Venezuela in which it was reported that for every US\$0.46 cents spent on prevention, US\$1.00 of benefit was saved in economic cost. No doubt similar benefits could have been derived had an *ex ante* approach been taken.

It can be concluded that there is recognition of the importance of DRR to achieving Jamaica's long term goals; however the traditional constraints which have been discussed in many reports and mentioned in this report – inadequate resources, low political will, weak governance to name some – must be overcome in order for sustained progress to be made.

9.0 RECOMMENDATIONS

In *Vision 2030 Jamaica*, Outcome 14 is *Hazard Risk Reduction and Adaptation to Climate Change*. National and sectoral strategies for achieving this outcome and a performance monitoring framework for measuring progress are enunciated. These strategies, address the challenges identified for DRR-CCA. It is significant that during stakeholder consultations, there was consensus that the DRR-CCA strategies identified in *Vision 2030 Jamaica* should be maintained. This suggests that there is support for those strategies. The first recommendation therefore, is that **the government should dedicate adequate resources to achieving the targets for Outcome 14 under *Vision 2030 Jamaica*.**

More specific recommendations are given below:

Legal, policy and institutional framework

The DPEM 1993 Act has been reviewed and updated into the soon to be Disaster Risk Management Act (2014). Effective implementation of this Act should be a priority.

The oft-repeated recommendations on enforcing existing legislation, on incorporating DRR-CCA into land use planning, physical planning, environmental management; on illegal occupation of land, safe construction of buildings, fire safety and public health, among others, remain valid. The Building Code should be passed into law as a matter of urgency.

The NDP is a comprehensive document which sets out pre and post disaster actions, roles and responsibilities for hazards which threaten Jamaica. However the plan must be updated to reflect the experiences of responding to more recent disaster events and management of humanitarian relief, increased focus on DRR, emerging threats and climate variability and change is required. A plan for Continuity of Government Operations should be included in the NDP.

The Draft *Hazard Risk Mitigation Policy* should be finalised, approved by Cabinet and circulated for feedback before White Paper submission.

Risk mapping, risk analysis, hazard mapping and data management

A national hazard, risk mapping and analysis programme with clearly stated priorities should be developed and funded. Hazard mapping has so far focussed on natural hazards. Other hazards such as diseases, bush fires and pest outbreaks, which can be expected to become more of a threat under some climate change scenarios, as well as technological hazards, should be included in the hazard mapping and risk analysis programme.

The discussion among stakeholders related to data collection, management and sharing, and which includes standardisation of methods for hazard mapping and risk analysis as well as developing disaster risk scenarios should continue. Consideration should be given

to including requirements for data collection, management and sharing in the regulations of the revised disaster legislation.

There should be examination of current data collection approaches to ensure that data related to women, children and vulnerable groups is adequately collected and analysed.

The CARDIN database is effective for archiving information and academic papers on DRM. However, lack of financial and document support are gaps that should be addressed. The database should be widely publicised and authors should be encouraged to submit their publications to CARDIN to increase information dissemination and sharing. The DESINVENTAR data base should also be kept updated.

Disaster Risk Reduction and Climate Change Adaptation

The research into downscaling of global models by the Mona Climate Studies Group should be supported and the outputs should be factored into all physical planning, development planning, socio-economic planning, hazard mapping and risk analyses as part of DRR - CCA planning.

There should be immediate examination of set-back requirements in light of projections for climate change impacts and a re-evaluation of the way in which coastal development as well as placement of infrastructure takes place. Planning for diversification of the tourism product should also be looked at.

The value of ecosystems in disaster risk reduction seems to be under-appreciated, although this is slowly changing. Protection of ecosystems should be included in DRR plans at all levels and CBDRM programmes should include protection of ecosystems as part of DRR-CCA.

Several projects are implemented annually relating to DRM, DRR and CCA. The creation of a project inventory data base for DRM, DRR and CCA related projects in Jamaica would ensure that efforts would not be duplicated, that gaps would be addressed and synergies created.

Risk Transfer

The government should consider investing in risk transfer mechanisms other than CCRIF for national assets. Risk transfer options are also needed at sub-national and community levels.

Vulnerable populations

The projected continuing increase of elderly persons, especially those without social support and economic means, within the population must be taken into account during DRM planning. Significantly, many self-employed persons do not contribute to a pension plan, leaving them without a source of income in retirement, and thus vulnerable to the effects of disasters. This suggests that future disaster plans will have to be made for this group in addition to other vulnerable groups such as children and persons with

disabilities. Gender issues are also under-represented in disaster plans and should be included.

Most DRM/DRR interventions do not currently include livelihoods considerations. The DRR community could learn from climate change adaptation projects many of which include a sustainable livelihoods component. Attention to livelihoods security is also important for reducing social vulnerability.

Emerging threats and anthropogenic hazards

Historically natural hazard threats have been the main focus of the country's DRM efforts. Although several plans exist for anthropogenic hazards, including animal and plant diseases, these plans are not regularly tested. The tanker fire of 2014, the Chikungunya outbreak and the Ebola threat of 2014 show the necessity of ensuring that these threats are given due focus. Regular training of actors, testing and updating of plans should be done. Where relevant, DRR measures should be put in place.

There is increasing focus on modernising strategies and laws to manage the threat from cybercrime. The government is increasing its emphasis on ICT, and is increasing conversion to e-government. There is therefore the potential for disruption of government activities through cyber attacks. Adequate plans should be developed to manage this threat and should be included as a sub-plan of the NDP.

The proposed port and logistics hub increase the potential for transportation and hazardous materials incidents. Review of the relevant sub-plans of the NDP should be undertaken, as well as training and simulation exercises.

Societal Integration of DRR

It is self-evident but worth repeating that DRR cannot be separated from national development and societal issues. Wider social issues such as poverty, unemployment, land tenure, adequate social safety nets for the most vulnerable, law enforcement and economic growth must be addressed if Jamaica is to see permanent gains in DRR. In this regard, it is important that DRR is integrated into social initiatives and projects such as those implemented by the Jamaica Social Investment Fund (JSIF) which is managing *inter alia* interventions such as:

1. Inner City Basic Services Project;
2. Poverty Reduction Programme II;
3. Jamaica Violence Action Fund project;
4. Rural Economic Development Initiative (REDI);
5. Community Investment Project and Basic Needs Trust Fund (phase six); and
6. The Integrated Community Development Project (ICDP).

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APPENDICES

Appendix 1: List of selected CCA-DRR related projects.

Projects and Programmes	Objectives and Outcomes
Climate Change Adaptation and Disaster Risk Reduction (CCADRR) Project (GOJ/EU/UNEP) 2010-2013	Objective: To adapt to climate change and contribute to sustainable development in Jamaica, particularly in vulnerable communities, through increasing resilience and reducing risks associated with natural hazards Results: <ol style="list-style-type: none"> 1. Rehabilitated watersheds through slope stabilization measures such as reforestation of denuded hillsides 2. Increased resilience of selected coastal areas against potential climate change impacts 3. Climate change capacity building and awareness raising
Capacity Building for Sustainable Land Management (UNDP-GEF) 2010-2012 (30 months)	Objective: To enhance effective sustainable land management (SLM) by building capacities for SLM in appropriate government and civil society institutions and user groups and mainstreaming SLM into government planning and strategy development. Outcomes: <ol style="list-style-type: none"> 1. SLM is mainstreamed into national institutions, policies, strategies and plans 2. Capacity for management, application and adaptation of SLM is enhanced 3. Effective management and adaptive learning is achieved.
Coastal Multi-Hazard Mapping & Vulnerability assessments towards Integrated Planning & Reduction of Vulnerability for Portland Cottage, Morant Bay & Manchioneal, Jamaica 2010-2011 (World Bank-GFDRR)	Objectives include: Complete Multi-Hazard Assessment & develop multi-Hazard Maps; carry out vulnerability & risk assessments; Produce disaster/Risk Management plans for three communities in Jamaica - Portland Cottage, Clarendon; Morant Bay, St Thomas; and Manchioneal, Portland
Reducing Climate Change-Driven Erosion and Landslide Risks through Sustainable Agriculture (JCDT)	Objective: To increase the capacity of the targeted farming communities on the slopes of the Blue Mountains to adapt to climate change. The outcomes expected are: <ol style="list-style-type: none"> 1. Increased agro-technical capacity for applying soil conservation techniques that are necessary in steep slope environments. 2. Alternative livelihood practices promoted. 3. Forest and tree cover (with appropriate species) promoted on slopes that are vulnerable to climate-driven increases in erosion and landslide risks.
Reforestation and	Objectives are:

Projects and Programmes	Objectives and Outcomes
Promotion of Best Farming Practices to mitigate the effects of landslides in Somerset, St. Thomas (FCF) 2010-2013	<ol style="list-style-type: none"> 1. To enhance the environmental health and living conditions in the Somerset community by addressing the problem of erosion, landslides and flood risks through mixed reforestation on erosion-prone areas of Somerset and the installation of slope stabilization mechanisms. 2. To provide local farmers with training in best farming practices most suitable for hilly areas 3. Building the capacity of the community to carry out proper environmental stewardship.
Programme on Promoting Rain Water Harvesting and Small Scale Irrigation in South St. Elizabeth (FAO/GOJ)	Objective: To enhance food security and socio-economic well-being of farmers in South St. Elizabeth by promoting increased crop production through rain water harvesting, improved water management and introduction of small scale irrigation technology.
Improving Jamaica's Agricultural Productivity (GOJ/CIDA)	Objective: To strengthen sustainable agriculture productivity in Jamaica by improving the productivity of Jamaican farmers and fisher folks, through the use of more durable greenhouses and improved environmental management in small scale fisheries. Components: <ol style="list-style-type: none"> 1. Green-house development 2. Beach rehabilitation component
Rain Water Harvesting (RWH) (WRA)	Objective: To increase awareness of government and the public as to the potential for RWH as a sole water supply source in areas of Jamaica presently without access to water and as an augmentation source in areas regularly affected by drought
Risk and Vulnerability Assessment Methodology Project (RiVAMP) (UNEP)	Objective: The pilot testing of a methodology that takes environmental factors into account when analysing disaster risk and vulnerability, with special focus on climate change
Pilot Program for Climate Resilience (PPCR) (PIOJ)	In the design stage. To establish Climate Information Platform through which range of information will be made available and facilitate awareness building and make resources available to finance adaptation at the community level
Assistance to Improve Local Agricultural Emergency Preparedness in Caribbean Countries (GOJ, FAO)	Project Goal: To contribute to community based disaster management planning and community level risk management within the agricultural sector through, among other things: <ol style="list-style-type: none"> i) Improvements in institutional frameworks and technical options for hurricane-related disaster preparedness. ii) Emergency response and post-emergency agricultural assistance.
Negril Beach Restoration	Objective: To implement measures that will mitigate against

Projects and Programmes	Objectives and Outcomes
Programme (NEPA/GOJ)	further coastal erosion of the Negril area, by implementing appropriate coastal restoration/rehabilitation works.
Rehabilitation of the Negril Wastewater Treatment Plant (GOJ/EU) (12-month commenced February 2011)	<p>Objectives: Raising and connecting the embankments of the stabilisation ponds; installing flow control devices; improving the outlet structure</p> <p>Outcome: preservation of the coastal, natural environment; improved quality of the sea water and beaches; growth in aquatic biodiversity; and improved sanitary condition in the local communities</p>
Increasing the Resilience of Coastal ecosystems to Climate Change (NEPA/GOJ)	<p>Replanting of sea-grass and mangroves</p> <p>Installation of data loggers to record sea surface temperatures</p> <p>Preparation of a management plan for the marine protected area</p>
Marketing and Agriculture for Jamaican Improved Competitiveness (MAJIC) (ACDI/VOCA)	Advancing the development of a modern, efficient and internationally competitive agricultural sector in Jamaica through support to specific crops.
Enhancing the Resilience of the Agriculture Sector and Coastal Areas to Protect Livelihoods and improve Food Security Project (also called the Adaptation Fund Project). (PIOJ/ODPEM/NEPA)	<p>Overall Objective: To protect livelihoods and food security in vulnerable communities by: improving land and water management for the agricultural sector, strengthening coastal protection and building institutional and local capacity for climate change adaptation.</p> <p>The three components of the programme are outlined as follows:</p> <ul style="list-style-type: none"> - Component 1: Increasing climate resilience of the Negril coastline. - Component 2: Enhancing climate resilience of the agricultural sector by improving water and land management in select communities. - Component 3: Improving institutional and local level capacity for sustainable management of natural resources and in disaster risk reduction in the targeted vulnerable areas; and raising awareness for behaviour modification.
Enhancing Knowledge and Application of Comprehensive Disaster Management (EKACDM Initiative) (2013-2018) UWI-DRRC	<p>This project aims to establish a programmatic framework to enhance the approach to Comprehensive Disaster Management (CDM) in the Caribbean, by emphasizing disaster loss reduction through risk management. The Initiative will:</p> <ul style="list-style-type: none"> • Establish a data portal to manage and share knowledge across CDM networks in the Caribbean; • Develop guidelines for policies that link CDM to

Projects and Programmes	Objectives and Outcomes
	<p>decision making and planning for development;</p> <ul style="list-style-type: none"> • Encourage closer working relationships between stakeholders to reduce losses in the event of disasters; • Promote Risk Management to reduce losses due to disasters; • Standardize tertiary level educational programmes and training material in Risk Management for students, professionals and others employed in the field; and • Support Small and Medium sized Enterprises (SMEs) in key economic sectors to employ fact-based decision-making and policies that improve resilience to disasters.
<p>Multi- Country Study on Effective Law and Regulation for DRR</p> <p>International Federation of Red Cross and Red Crescent Societies (IFRC) and the United Nations Development Programme (UNDP)</p>	<p>Overall objective: supporting the strengthening of domestic legislation for disaster risk reduction (DRR). The project envisaged the development of two products:</p> <ul style="list-style-type: none"> • A multi-country study of the DRR-related legislation of 31 countries and • A ten-point “Checklist on Law and Disaster Risk Reduction”.
<p>Global Climate Change USAID COMET II Project</p> <p>United States Agency for International Development (USAID)</p>	<p>The project will seek to enhance safety and security in twenty five communities across five parishes in Jamaica. The objectives of the project are:</p> <ol style="list-style-type: none"> 1. to strengthen community and civil society organizations (CSOs), increase citizen cooperation and accountability, strengthen juvenile justice and youth at-risk programs. 2. to further support community-based policing practices. 3. to advance cross-cutting development themes including gender equity, disability rights and HIV prevention, by integrating specific targeted interventions across the wider suite of programmatic activities. 4. to support climate change adaptation in project communities primarily through capacity building and resilience planning.

Appendix 2: Identification of Key Actions for Disaster Risk Reduction (DRR) in Jamaica.

What is —and what is not— the Matrix of Criteria for prioritizing Disaster Risk Reduction (DRR) actions?

The Set or Matrix of Criteria was designed as an instrument to accompany *ex-ante* analysis processes to build Disaster Risk Reduction (DRR) planning profiles, based on observation and rapid analysis of relevant information available from national and international information sources. The Matrix establishes categories and key questions about particular situations and risk management processes and provides criteria relevant to the responses, using a traffic light scheme. Each question is accompanied by key variable(s) for which information is required. Thus, decision makers will have specific signals that allow them to prioritize their planning process for DRR.

The instrument does not seek a high degree of synthesis, which could be confused with some of the existing aggregate indicators such as those developed by the Inter-American Development Bank (IDB), the World Bank, DARA or the *Organization of Eastern Caribbean States (OECS)*, among others. Similarly, it is designed for medium-term programme *ex-ante* processes and, therefore, is not suitable for project monitoring, performance measurement or *ex-post* assessments.

The set, known as the Matrix of Criteria, is built to quickly use available information, which may be qualitative and quantitative. As such, it does not seek to generate aggregations or define specific measures comparable between areas or countries, but the identification of relevant aspects to be considered during planning.

In summary, the Matrix is:

- ☒ **Not** a DRR index.
- ☒ **Not** a criterion for selecting the type of DRR actions to be carried out in programmes or projects.
- ☒ **Not** a means to rate DRR actions.
- ☒ **Not** a means for evaluating programmes or projects.
- ☑ **It is** a document that helps generating an initial profile that provides a roadmap to guide the priorities that should be considered in DRR processes.

Categories

FOCUS OF ANALYSIS	CATEGORIES
RISK	<p>1. Apparent and immediately recognizable signs of hazard and exposure. This category focusses on the obvious manifestations of disasters, without entering into a more complex risk analysis. The criterion is essential as it provides a first insight into the country situation and its sub-national and local levels. This criterion should be considered as an element of decision-making in the short term.</p>
	<p>2. Drivers of risks in the country and their configuration in the territory This refers to political, social and economic conditions underlying the social construction of risk. This concept stems from two central ideas: (i) the understanding of risk as a process, i.e. with a specific background and therefore not a spontaneous or casual situation, but rather a phenomenon that occurs when certain conditions of territorial sustainability are ignored in the development process; and (ii) that the processes underlying the construction of risk are essentially social, despite the fact that physical phenomena associated with disasters may be natural.</p>
MANAGEMENT	<p>3. Current capacities for risk management This category is extremely important since it prioritizes observations about hazard and exposure: for example, a country with less hazard but unprepared compared with another with high risk of hazards but highly prepared. These conditions are observable through national and international reports and refer to how a country has or has not developed capacities at the national and sub-national level.</p>
	<p>4. Enabling regulations This refers to the existence of a regulatory framework for action on imminent risk conditions that facilitates and strengthens the capacity to manage risk. These regulations must be found within the legislation on disaster risk, but above all, in sector-specific and municipal regulations, customs codes, health legislation, building regulations and others.</p>
	<p>5. Trends and future prospects This category is designed to identify risk trends, particularly through the availability and management scenarios and forecasts on issues such as climate change.</p>

Relevance

This includes an assessment and rating or qualitative parameter that determines —for the purposes of the Guidelines— the ‘priority’, ‘observable’ or ‘non-priority’ status of a criterion. The logic of this analysis is based on the use of the colours of a traffic light as a ‘relevance ranking’ where:

Red (highly relevant or priority level): implies a determining state or condition for programmatic intervention for this area or criterion in the territory under review.

Yellow (relevant or observable): represents a condition that must be carefully observed and compared with other inputs in order to make a final decision on whether to intervene.

Green (low relevance or non-priority): implies an ideal or acceptable condition for the criteria evaluated in the territory, i.e. there is not a priority condition for programmatic intervention in the medium term.



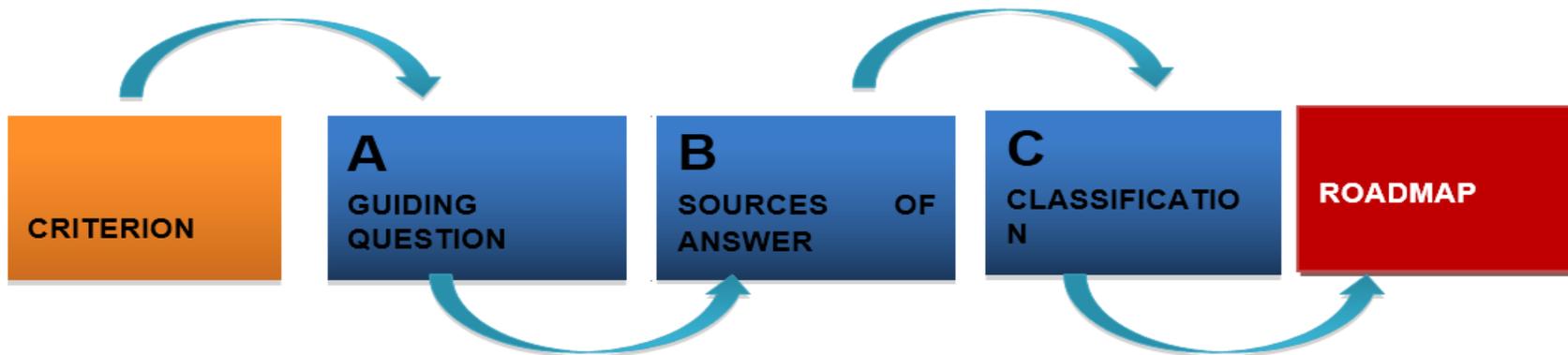
3.1. Selection of the territory

The selection of national level assessment was based on the following premise:

1. On request from the Office of Disaster Preparedness and Emergency Management (ODPEM) that the criteria be applied at the national level.

3.2. Application of criteria

The following diagram displays the logic the set of criteria defined by the methodology were applied. The methodology was applied with a nation national approach to identify DRR priorities.



STEP A. Guiding question: Initial questioning predetermined by the methodology on the current condition or the information available on the criteria under review.

STEP B. Source of answer: Exercise to identify and compile the sources of information needed to answer the guiding question.

STEP C. Relevance ranking: The rating of the answers according to the traffic light colours (red, yellow, green), based on the analysis of the information available for the prioritization or assessment of the criteria.

Roadmap of priorities/profile of the territorial area in relation to DRR priorities: Final consolidation of highly relevant criteria (red) in a single instrument with recommendations for the design of a DRR programme, and monitoring of moderate relevance (yellow) criteria. It is not applied to each particular question but as the last step to finalize the analysis process.

Profile of Jamaica in terms of DRR priorities for planning/programming processes — Roadmap of Priorities

Having applied all of the prioritization criteria, the following categories were assigned:

- **Highly relevant condition (red),**
- **Moderately relevant condition (yellow),** and
- **Low priority relevant condition (green).**

The 'A' ranking could provide a basis for the priority routing of resources through intervention plans/programmes/projects to improve the risk conditions or management in the selected territorial area in the medium term.

The 'B' Ranking corresponds to the second level of prioritization or moderate relevance, which may be kept under observation by the funding sources for intervention once the red intervention areas have been addressed. Sustainability and improvement strategies may be contemplated if required or if a lack of monitoring leads to deterioration or to a relevant condition (red).

The Table illustrates the priorities and strategies developed by stakeholders using these Guidelines:

CATEGORY	RANK	HIGHLY RELEVANT TOPICS FOR PROGRAMMATIC INTERVENTION IN JAMAICA (RED)	SUGGESTED STRATEGIES FOR IMPLEMENTATION IN THE SHORT-TERM
2. Drivers of risk	A	Environmental degradation presents high indicators of impairment that generate severe impacts and can interact with the hazards, increasing the exposure and vulnerability of the population but management measures are being applied.	<ol style="list-style-type: none"> 1. Higher level of investment in environmental management and disaster risk reduction at all levels is required. 2. Integrate environmental issues in economic and social decision-making policies and processes. 3. Establish measures to incorporate hazard risk reduction in land-use practices and human settlements. 4. Adopt a community-based approach to hazard risk reduction. 5. Promote education and discussion about DRM and climate change through local and community media. 6. Develop efficient and effective governance structures for environmental management.

	A	Socio-economic indicators are predominantly low or medium in exposed populations (over 50 per cent of the population in the selected area).	<ol style="list-style-type: none"> 1. Conduct critical facilities audit programme and a national critical infrastructure rehabilitation, hardening and relocation programme. 2. Complete the National Spatial Plan and utilise development control measures. 3. Enforcement of related legislation, regulations and land-use plans. 4. Implementation of DRM best practices to reduce exposure where appropriate. 5. Create and strengthen national platforms and establish the foundation for hazard risk reduction by engaging in multi-stakeholder dialogue.
	A	There is a high and increasing occupation of urban areas at risk (over 30 per cent of the population of the analysis area) with inadequate control over the implementation of urban and rural land use planning regulations. Limited enforcement of control mechanisms for the occupation, use and transformation of urban landscape.	<ol style="list-style-type: none"> 1. Establish measures to incorporate hazard risk reduction in land-use practices and human settlements. 2. Design policies to minimize sprawl and encourage compact development, infill and redevelopment. 3. Ensure that development decisions are guided by a spatial planning framework. 4. Review existing land use patterns, zoning regulations, building codes and standards in the context of housing and urban development needs and formulate forward looking land use and development policies for efficient and optimum utilization of land. 5. Identify and designate high risk areas susceptible to multiple hazards as disaster

			<p>zones.</p> <p>6. Ensure safe, sanitary and affordable shelter for all. This should also include relocation of unplanned settlements in high risk zones.</p> <p>7. Enforce existing zoning, building and planning laws, regulations and codes.</p>
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CATEGORY	RANK	RELEVANT TOPICS TO BE MONITORED FOR FUTURE PROGRAMMATIC INTERVENTIONS IN JAMAICA (YELLOW)	SUGGESTED STRATEGIES FOR IMPLEMENTATION IN THE MEDIUM-TERM
1. Historical records of hazards, exposure and disasters	B	There are areas with recurring events, and there are records of previous impacts that have caused damage and losses; there is multi-hazard mapping and/or forecasts based on probabilistic criteria, but some of this information is outdated. An expert assessment is required to determine current conditions.	<ol style="list-style-type: none"> 1. Create a national framework for regular updating of hazard and risk maps and relevant data. 2. Review existing data/information and identify the gaps. 3. Develop and implement appropriate programs for interventions. 4. Create web-based maps to increase access and use. 5. Establish mechanisms for increasing resilience of the poor and most vulnerable. 6. Design housing settlements that are not vulnerable to hazards based on construction and rehabilitation techniques that enhance the long term usability.

	B	Existing information but without territorially disaggregated information on the impact of disasters. The existence of this type of information is essential to improve the quality of decision-making.	<ol style="list-style-type: none"> 1. Expand community level data collection across the island. 2. Standardize the format for data sharing and use. 3. Develop and implement training programmes to increase uptake and compliance. 4. Systematic disaggregation of data based on gender, age and other socio-economic indicators.
	B	There are clearly identified hazards (hurricanes, floods in major basins, droughts, earthquakes and others), as well as risk scenarios including the impacts of climate change, but there is need for more plans and risk scenarios that respond to the identified hazards and studies.	<ol style="list-style-type: none"> 1. Increase use of probabilistic risk assessment tools. 2. Incorporate hazard risk reduction in environmental and natural resources management. 3. Regulate the importation, storage, distribution, use and disposal (the management cycle) of chemicals and hazardous materials. 4. Create mechanisms to fully consider the impacts of climate change and ‘climate proof’ all national policies and plans. 5. Identify strategic priorities for adaptation to climate change and adopt best practices for climate change adaptation.

2. Drivers of risk	B	The population without access to essential services is between 20 per cent and 50 per cent of the population in areas exposed to hazards. Essential services are vulnerable and exposed to the identified hazards, but actions are being developed for their management.	<ol style="list-style-type: none"> 1. Develop institutional capacity to prepare for and respond to multiple hazards. 2. Construct and/or retrofit critical facilities/essential services to multiple hazards based on international standards. 3. Create opportunities for private sector involvement in hazard risk reduction, including business contingency planning. 4. Urgent need to prioritize programme for detailed assessments of all critical facilities. 5. Relocate or retrofit critical facilities especially those located in high risk areas and/or susceptible to multiple hazards and improve resilience to all forms of hazards. 6. Develop comprehensive disaster plans for critical facilities and improve emergency response capacity. 7. Ensure adequate and safe water supply and sanitation services.
	B	There are enabling regulations for risk management (safe and orderly use and occupancy of urban and rural territory, protection and management of watersheds, slopes, ecosystems and environment, building and planning codes to reduce risks), but low implementation. Formal accountability mechanisms by State agencies are not adequately enforced for risk management and environmental management.	<ol style="list-style-type: none"> 1. Continue to modernize the legal framework related to hazard risk reduction including legislation for management of humanitarian relief, dangerous goods/hazardous materials transport. 2. Infuse climate change data and projections into the physical planning system at all levels. 3. Review and update the appropriate institutional and legislative arrangements where necessary. 4. Complete and implement the revised Disaster Risk Management Act. (Act has been approved)

			<p>by both houses and is soon to be passed into law).</p> <p>5. Create a comprehensive and efficient planning system.</p> <p>6. Create an appropriate framework for sustainability planning.</p>
3.Current risk management capacities	B	<p>Institutional response structures are present but some lack plans, and capacity is limited due to resource constraints. Certain institutions are not fully integrated into the system. Community and institutional preparedness for emergencies and/or disasters exist in some institutions and communities.</p>	<ol style="list-style-type: none"> 1. Develop and implement plans for anthropogenic hazards. 2. Expand of existing CBDRM programme. 3. Develop a larger core of trained volunteers to effectively assist in managing emergency response. 4. Build capacity of state agencies and facilities (e.g. hospitals, fire services) to manage any potential disasters. 5. Improve emergency response capacity including capacity for search and rescue. 6. Develop capacity to cope with potential disasters (e.g. through continuing education, simulation exercises and drills). 7. Strengthen regional mechanisms for emergency response. 8. Expand public education campaigns to inform, increase awareness and encourage participation. 9. Include DRM in school curriculum. 10. Organise simulation exercises for various natural and anthropogenic hazards. 11. Increase coordination between public and private sector for response (review and anlyase. Chikungunya response).

	B	Coordination mechanisms of local governments are in place but do not fully integrate DRM and Environmental Management among their priorities.	<ol style="list-style-type: none"> 1. Ensure that key stakeholders, especially those at the local level, are included in the development and implementation of national disaster plans, parish disaster plans and community disaster plans. 2. Promote the integration of DRM and environmental management into planning at the local level. 3. Develop and implement capacity building initiatives to enhance coordination mechanisms of local authority and other stakeholders at the parish level. 4. Support the continued development/revision and implementation of both national and parish disaster plans. 5. Identify gaps and foster greater collaboration between stakeholders at local level to improve coordination and decision making. 6. Develop national disaster risk information platform to increase access and improve coordination between agencies.
	B	There are legal frameworks in place that enable the allocation or reallocation of resources once a disaster or emergency has occurred but there is limited funding for preparedness; access to resources is not streamlined or administrative processes are inadequate or ineffective.	<ol style="list-style-type: none"> 1. Mainstream DRM into related plans and budgets at the sectoral level. 2. Create and introduce economic and financial market instruments for risk transfer. 3. Dedicate 1 per cent of the national budget annually to the national disaster fund. 4. Disaggregate and clearly identify funding for DRM activities within the national budget.

	B	There are early warning and hazard monitoring system(s) in place, however some vulnerable groups such as the deaf and hearing impaired are excluded, and monitoring and warning systems need to be expanded to all hazards.	<ol style="list-style-type: none"> 1. Build adequate emergency response capability including early warning systems. 2. Expand early warning systems to improve coverage. 3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels by integrating hazard risk reduction into the early childhood, pre-primary, primary, secondary and tertiary education syllabuses and research community; and develop hazard risk reduction training for different groups of stakeholders. 4. Conduct simulations to assess the readiness and effectiveness of early warning systems at all levels where necessary. 5. Conduct capacity building for existing staff and acquire new staff. Acquire advanced technology at the national and local levels. 6. Sensitization of and support from key stakeholders (public sector, private sector and the general public). 7. Expand pilot system for warnings to persons with disabilities/impairments.
4. Enabling regulations	B	Regulations and legal instruments exist for DRM, consistent with national and international legal frameworks, but they are not effectively implemented or monitored.	<ol style="list-style-type: none"> 1. Modernise the legal and institutional frameworks related to hazard risk reduction. 2. Create and introduce economic and financial market instruments for risk transfer. 3. Finalize and implement the Disaster Risk Management Bill to strengthen the country's overall national disaster preparedness, emergency management and response processes

			<p>and mechanisms, through a range of measures such as recognizing the existing organisational structures, mandatory evacuation, declaration of disaster areas and earmarking high risk areas. (See note above).</p> <p>4. Revise and update the National Disaster Plan (and its related sub-plans) and the relevant legal and regulatory frameworks as necessary.</p> <p>5. Enforce provisions relating to the accountability of Government Officers with disaster responsibilities.</p>
	B	<p>There are inter-agency structures linked to form coordination and participation system - platform or entity - but its activation, capacity and work are limited.</p>	<p>1. Identify gaps and foster greater collaboration between Ministries, Departments and Agencies and other key stakeholders at all levels to improve coordination and decision making.</p> <p>2. Create and strengthen national platforms and establish the foundation for hazard risk reduction by engaging in multi-stakeholder dialogue.</p> <p>3. Encourage provision of the necessary resources (including financial and human resources) for preparedness, emergencies and response by the related agencies and organisations.</p> <p>4. Promote data sharing and management of information between stakeholders involved in the disaster risk management.</p> <p>5. Strengthen and/or mainstream DRR in Ministries/Departments/Agencies (MDAs) strategic and corporate plans.</p>

	B	There are some sectoral institutions with internally assigned Risk Management responsibilities and specific planning but there are limits in terms of DRM as a comprehensive process integrated into territorial development.	<ol style="list-style-type: none"> 1. Establish Country Risk Officers within public offices. 2. Develop and implement sector specific plans and/or policies in which more disaster risk management and climate change considerations are included. 3. Undertake research to identify sector-specific strategies for disaster risk management and climate change adaptation. 4. Promote business contingency planning among stakeholders especially those within the public and private sectors. 5. Build sectoral capacity relating to disaster risk management at all levels.
5.Trends and future prospects	B	There are scenarios about the impacts of climate change, but they are not fully coordinated or integrated into the risk management strategies at all levels.	<ol style="list-style-type: none"> 1. Create mechanisms to fully consider the impacts of climate change and ‘climate proof’ all national and sectoral policies and plans. 2. Apply disaster risk reduction framework to build on climate change adaptation measures all at levels to ensure measures are climate proofed. 3. Identify and integrate strategic priorities for adaptation to climate change. 4. Infuse climate change projections into the physical planning system. 5. Create and introduce economic and financial market instruments for risk transfer. 6. Develop risk scenarios and conduct simulations to assess the capacity of existing mechanisms at all levels. 7. Create more public, private and academia partnerships.

	B	There are mechanisms for risk trend analysis, but they are not adequately linked to the development analysis and planning process	<ol style="list-style-type: none"> 1. Integrate risk trend analysis into policies relating to planning, development, disaster risk management and climate change adaptation. 2. Establish an information platform for sharing of data and information needed for risk trend analysis within the public sector and private sector. 3. Develop and maintain mechanisms for risk trend analysis across all sectors and levels. 4. Develop a national risk information platform to assist with decision making across all sectors and levels. 5. Conduct research on changing nature of hazard risk trends across all sectors and levels. 6. Include comprehensive disaster risk assessments for major developments.
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CATEGORY	LOW PRIORITY TOPICS TO BE MONITORED FOR FUTURE PROGRAMMATIC INTERVENTIONS IN JAMAICA (GREEN)	SUGGESTED STRATEGIES FOR IMPLEMENTATION IN THE LONG-TERM
4. Enabling regulations	Advanced level of decentralization including the responsibilities of sub-national governments in risk management but limited in terms of implementation and the allocation of resources.	<ol style="list-style-type: none"> 1. Modernization of the local government system in Jamaica to enable local authorities to be more effective in all aspects of the disaster management cycle. 2. Support the development and implementation of parish disaster plans. 3. Facilitate capacity building of local authorities and other stakeholders where necessary. 4. Promulgation of the Disaster Management Act to recognize existing organisational structures, especially those relating to local authorities.

RECOMMENDED REFERENCES

This section provides a list of general sources and other information resources for the provision of information about the prioritization criteria for Latin American and the Caribbean countries.

This list is not intended to be exhaustive, but provides a basic access, which can be supplemented with information that is constantly being generated in the countries with the support of several national and international agencies.

Question N°	Source and location	Type of information
1	<p>Country documents DIPECHO project [Central America / South America / Caribbean]: http://www.desaprender.org/tools http://www.crid.or.cr/index.shtml</p> <p>Social Historical Cartography: http://www.desinventar.net/</p> <p>CAPRA http://www.ecapra.org/es/capra-gis-0</p> <p>ECHO Matrix: http://www.desaprender.org/tools/documento-regional-2012?locale=en</p> <p>Vulnerability Benchmarking Tool (BTool) http://www.oecs.org/doc-lib/economic-union/doc_view/80-vulnerability-benchmarking-tool-booklet-</p>	<p>Country documents: within the cooperation framework between ECHO and UNISDR, information available in Latin American and Caribbean countries on risk management is compiled and continuously updated. This is a good reference in each country on its risk management condition.</p> <p>DesInventar: Is a free information source on disasters. It includes all Latin American and Caribbean countries, offering statistics and maps for each country.</p> <p>CAPRA: It is an information platform on disaster risk for decision making using common tools and a methodology to evaluate and showcase disaster risk.</p> <p>ECHO Matrix: It is a regional matrix of indicators for first response capacities of the municipal structures before disasters of socio-natural origin. Recovering local information in the country.</p>

	<p>?tmpl=component&format=raw⁵⁷</p> <p>Technical and scientific studies that include territorial and recurrence information. In academic centers.</p> <p>Local Disaster Index (LDI) of the Inter-American Development Bank (IDB) http://www.iadb.org/en/topics/natural-disasters/disaster-risk-indicators/disaster-risk-indicators,1456.html</p>	<p>Technical and scientific studies: Academic centers carry out studies on recurrence. One can also take into account NGOs.</p> <p>Local Disaster Index (LDI): Captures how likely it is that small-scale disasters occurred in a country and the cumulative impact that such events cause at the local development.</p>
2	<p>Local Disaster Index (LDI) of the Inter-American Development Bank (IDB) http://www.iadb.org/en/topics/natural-disasters/disaster-risk-indicators/disaster-risk-indicators,1456.html</p> <p>Social Historical Cartography: http://www.desinventar.net/</p> <p>CAPRA http://www.ecapra.org/es/capra-gis-0</p> <p>ECHO Matrix:</p>	<p>Local Disaster Index (LDI): Captures how likely is the country to small-scale disasters occurrence and the cumulative impact that such events cause to local development.</p> <p>DesInventar: Is a free information source on disasters. It includes all Latin American and Caribbean countries, offering statistics and maps for each country.</p> <p>CAPRA: It is an information platform on disaster risk for decision making using common tools and a methodology to evaluate and showcase disaster risk.</p> <p>ECHO Matrix: It is a regional matrix of indicators for first response capacities of the municipal structures before disasters of socio-natural origin. Recovering local</p>

⁵⁷ The BTool, generated by the Organization of Eastern Caribbean States is a tool for comparative analysis of information about risk and risk management in their Member States. In cases where it is applied it may constitute an ideal source of information, applicable to the structure of the criteria matrix.

	http://www.desaprender.org/tools/documento-regional-2012?locale=en	<p>information in the country.</p>
3	<p>ECHO Matrix: http://www.desaprender.org/tools/documento-regional-2012?locale=en</p> <p>DIPECHO project country documents [Central America / South America / Caribbean]: http://www.desaprender.org/tools http://www.crid.or.cr/index.shtml</p> <p>Atlas or risk maps, hazards or vulnerabilities in the territory (Multi-hazard)</p>	<p>ECHO Matrix: It is a regional matrix of indicators for first response capacities of the municipal structures before disasters of socio-natural origin. Recovering local information in the country.</p> <p>Country documents: within the cooperation framework between ECHO and ISDR, information available in countries of Latin America and the Caribbean on risk management is compiled and continuously updated. This is a good reference in each country on its risk management condition.</p> <p>Atlas or risk maps: institutions responsible of the emergency care in the country may have information about threats or vulnerabilities in the territory.</p>

<p>4</p>	<p>Prevalent Vulnerability Index (PVI) of the Inter-American Development Bank (IDB) http://www.iadb.org/en/topics/natural-disasters/disaster-risk-indicators/disaster-risk-indicators.1456.html</p> <p>Registries of ministries, secretariats or environmental authorities of the country [(i) deforestation rate, (ii) soil degradation (iii) hydric stress and (iv) environmental performance index (inverted)].</p> <p>DARA. Risk Reduction Index (RRI) Environmental degradation and loss of environmental services. http://daraint.org/wp-content/uploads/2010/10/RRI.pdf</p>	<p>Prevalent Vulnerability Index (PVI): Characterizes the prevailing vulnerability conditions of the country in terms of exposure in prone areas, its socioeconomic fragility and their lack of resilience, which are aspects that favor the direct physical impact and indirect and intangible impact in case of a dangerous phenomenon.</p> <p>Registries: Check with the corresponding institutions the recommended indicators.</p> <p>DARA: It measures controls on land use, urban planning, drought, rainfall.</p>
<p>5</p>	<p>Records of the institutes, secretariats or statistics and censuses responsible of the country.</p> <p>UNDP - Human Development Reports http://hdr.undp.org/en/</p> <p>UNICEF Statistics http://www.unicef.org/infobycountry/latinamerica.html</p>	<p>Records: Check with the people responsible of the statistical information demographic data, poverty, socio economic, health, education.</p> <p>HDR-UNDP: UNDP annually performs human development Country Reports hence local and national data on the socioeconomic conditions of the population can be retrieved.</p> <p>UNICEF: It offers a compiled statistics on population, territory, poverty, demographics.</p>

	<p>World Bank Indicators http://data.worldbank.org/indicator</p> <p>DARA. Risk Reduction Index (RRI) Socio-economic conditions negative and lack of resilience. http://daraint.org/wp-content/uploads/2010/10/RRI.pdf</p>	<p>World Bank: Offers a statistic compiling different governmental elements, of the population, economic, health, environment, infrastructure, climate change among other indicators.</p> <p>DARA: Measures socioeconomic conditions that challenge disaster risk management.</p>
6	<p>Registries of the institutes, secretariats or statistics and censuses responsible of the country; as well as of ministries, secretariats or the country planning authorities</p> <p>World Bank Indicators http://data.worldbank.org/indicator</p> <p>DARA. Risk Reduction Index (RRI) Socio-economic conditions negative and lack of resilience. http://daraint.org/wp-content/uploads/2010/10/RRI.pdf</p>	<p>Registries: Check with the people responsible of the statistical information demographic data, poverty, socio economic, health, education, as well as the planners in terms of decentralization.</p> <p>World Bank: Offers a statistic compiling different governmental elements, of the population, economic, health, environment, infrastructure, climate change among other indicators.</p> <p>DARA: Measures socioeconomic conditions that hinder disaster risk management and population resilience.</p>
7	<p>DIPECHO project country documents [Central America / South America / Caribbean]: http://www.desaprender.org/tools http://www.crid.or.cr/index.shtml</p>	<p>Country documents: within the cooperation framework between ECHO and UNISDR, information available in Latin American and Caribbean countries on risk management is compiled and continuously updated. This is a good reference in each country on its risk management condition.</p>

	<p>HFA Monitor: http://www.preventionweb.net/files/2259_IndicatorsofProgressHFA.pdf</p> <p>DRM-related legislation (land use, management and watersheds and hydric resources protection, construction and urban planning codes, risk evaluation in essential buildings and public services)</p> <p>ARA. Risk Reduction Index (RRI): Poor governance. http://daraint.org/wp-content/uploads/2010/10/RRI</p>	<p>HFA Monitor: is a tool that captures information on the progress of the Hyogo Framework for Action; above all, it consists of indicators to monitor and review the progress and challenge in disaster risk reduction implementation; serves at a more political level.</p> <p>Law: Conduct a review into the country's laws to determine those related to disaster risk management.</p> <p>DARA: Analyzes the bureaucracy and coordination of authorities (national, local and sub national levels)</p>
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<p>8</p>	<p>UNDP - Human Development Reports http://hdr.undp.org/es/</p> <p>UNICEF Statistics http://www.unicef.org/spanish/infobycountry/latinamerica.html</p> <p>World Bank Indicators http://datos.bancomundial.org/indicador/</p> <p>Records of the institutes, secretariats or statistics and censuses responsible of the country; as well as of ministries, secretariats or the country planning authorities.</p> <p>DARA. Risk Reduction Index (RRI): Inadequate territory planning and improper use of soil. http://daraint.org/wp-content/uploads/2010/10/RRI.pdf</p>	<p>HDI-UNDP: UNDP annually performs human development Country Reports, hence local and national data on the socioeconomic conditions of the population can be retrieved.</p> <p>UNICEF: It offers a compiled statistics on population, territory, poverty, demographics.</p> <p>World Bank: Offers a statistical compiled on different governmental elements, of the population, economic, health, environment, infrastructure, climate change among other indicators.</p> <p>Records: Check with the people responsible of the statistical information demographic data, poverty, socio economic, health, education, as well as the planners in terms of decentralization.</p> <p>DARA: Analyzes infrastructure and differences between urban and rural areas in relation to localization.</p>
<p>9</p>	<p>Country's National Development Plans.</p> <p>Institutional memories of the ministries and public institutions, local governments of the country.</p>	<p>National Development Plans of the country: The plans define the development; also take into account whether there are five-year plans or longer term efforts.</p> <p>Memories: Institutional memories give an account of the achievements, progress and challenges of each institution; they collect relevant information on the current situation of each sector.</p>

	<p>External risk assessments carried out by Non-Governmental or International Cooperation Agencies.</p> <p>ECHO Matrix: http://www.desaprender.org/tools/documento-regional-2012?locale=en</p> <p>HFA Monitor: http://www.preventionweb.net/files/2259_IndicatorsofProgressHFA.pdf</p>	<p>External evaluations: external evaluations collected factual information about the country's risks; government information can be reviewed with the non-governmental.</p> <p>ECHO Matrix: It is a regional indicators matrix of first response capability of the municipal structures before disaster of socio-natural origin. Recovering local information in the country.</p> <p>HFA Monitor: is a tool that captures information on the progress of the Hyogo Framework for Action; above all, it consists of indicators to monitor and review the progress and challenge in disaster risk reduction implementation; serves at a more political level.</p>
10	<p>Country's National Development Plans.</p> <p>Institutional memories of the ministries and public institutions, local governments of the country.</p> <p>External risk assessments carried out by Non-Governmental or International Cooperation Agencies.</p> <p>ECHO Matrix: http://www.desaprender.org/tools/documento-regional-2012?locale=en</p> <p>HFA Monitor: http://www.preventionweb.net/files/2259_IndicatorsofProgressHFA.pdf</p>	<p>National Development Plans of the country: The plans define the development path; also take into account whether five-year plans or longer term efforts.</p> <p>Memories: Institutional memories give an account of the achievements, progress and challenges of each institution; they collect relevant information on the current situation of each sector.</p> <p>External evaluations: external evaluations collected factual information about the country's risks; government information can be reviewed with the non-governmental.</p> <p>ECHO Matrix: It is a regional indicators matrix of first response capability of the municipal structures before disaster of socio-natural origin. Recovering local information in the country.</p> <p>HFA Monitor: is a tool that captures information on the progress of the Hyogo Framework for Action; above all, it consists of indicators to monitor and review the progress and challenge in disaster risk reduction implementation; serves at a</p>

	<p>Risk Management Index (RMI) of the Inter-American Development Bank (IDB) http://www.iadb.org/en/topics/natural-disasters/disaster-risk-indicators/disaster-risk-indicators,1456.html</p>	<p>more political level.</p> <p>RMI: Performance measurement of disaster risk management. It is a quality measurement of the management based on pre-established levels or desirable references (benchmarks) to which risk management should be directed to, which would be the degree of progress</p>
11	<p>Country's National Development Plans.</p> <p>Institutional memories of the ministries and public institutions, local governments of the country.</p> <p>External risk assessments carried out by Non-Governmental or International Cooperation Agencies.</p> <p>HFA Monitor: http://www.preventionweb.net/files/2259_IndicatorsofProgressHFA.pdf</p> <p>Disaster Deficit Index (DDI) of the Inter-American Development Bank (IDB) http://www.iadb.org/en/topics/natural-</p>	<p>National Development Plans of the country: The plans define the development path; also take into account whether there are five-year plans or longer term efforts.</p> <p>Memories: Institutional memories give an account of the achievements, progress and challenges of each institution; they collect relevant information on the current situation of each sector.</p> <p>External evaluations: external evaluations collected factual information about the country's risks; government information can be reviewed with the non-governmental.</p> <p>HFA Monitor: is a tool that captures information on the progress of the Hyogo Framework for Action; above all, it consists of indicators to monitor and review the progress and challenge in disaster risk reduction implementation; serves at a more political level.</p> <p>IDD: Corresponds to the relationship between the demand for contingent economic funds to cover losses caused by the maximum considered event (MCE) and current resilience economic public sector, corresponding to the availability or access to internal or external funds in the country to restore the affected physical</p>

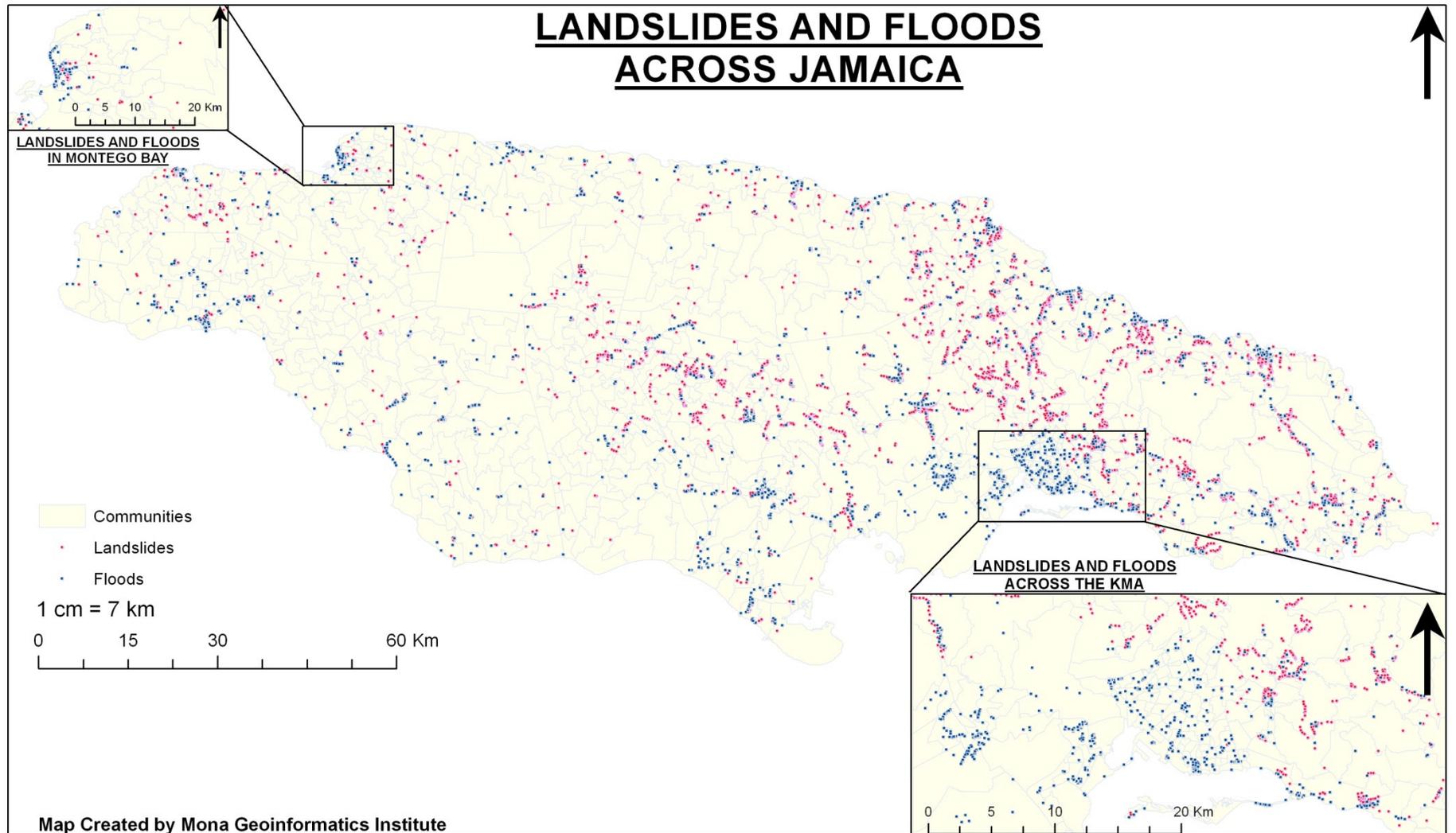
	disasters/disaster-risk-indicators/disaster-risk-indicators,1456.html	inventory.
12	<p>Projects or specific programs with the application and coverage of early warning systems in the country.</p> <p>National Platform record or non-governmental or international agencies that compile Early Warning Systems experience in the country.</p>	<p>Projects: Check the early warning systems that the country has.</p> <p>Records: Check other early warning systems from NGOs indicating early warning system experiences.</p>
13	<p>Compilation of: regulatory bodies or comprehensive laws in risk management, and other standards as decrees, regulations or sectorial laws</p> <p>HFA Monitor: http://www.preventionweb.net/files/2259_IndicatorsofProgressHFA.pdf</p> <p>Risk Management Index (RMI) of the Inter-American Development Bank (IDB) http://www.iadb.org/en/topics/natural-disasters/disaster-risk-indicators/disaster-risk-indicators,1456.html</p> <p>CAPRADE-PREDECAN System</p>	<p>Laws: Conduct a review of the country's laws to determine those related to disaster risk management as well to include sectorial laws, decrees and regulations</p> <p>HFA Monitor: is a tool that captures information on the progress of the Hyogo Framework for Action; above all, it consists of indicators to monitor and review the progress and challenge in disaster risk reduction implementation; serves at a more political level.</p> <p>RMI: Performance measurement of disaster risk management. It is a quality measurement of the management based on pre-established levels or desirable references (benchmarks) to which risk management should be directed to, which would be the degree of progress</p> <p>CAPRADE-PREDECAN System Monitoring: directed to the Andean countries,</p>

	<p>Monitoring http://www.riesgoycambioclimatico.org/TalerColombiaHyogo/SMOI_CAPRADE_PREDECAN.pdf (in Spanish available)</p>	<p>in order to measure governance, the existence or not of regulatory frameworks, planning, and incorporation of risk management plans.</p>
14	<p>General risk laws of the country and the rules governing the national, sub national and sectorial planning in each country systems.</p> <p>HFA Monitor: http://www.preventionweb.net/files/2259_IndicatorsofProgressHFA.pdf</p> <p>CAPRADE-PREDECAN Monitoring System http://www.riesgoycambioclimatico.org/TalerColombiaHyogo/SMOI_CAPRADE_PREDECAN.pdf (in Spanish available)</p>	<p>Law: Conduct a review into the country's laws to determine those related to disaster risk management and planning.</p> <p>HFA Monitor: is a tool that captures information on the progress of the Hyogo Framework for Action; above all, it consists of indicators to monitor and review the progress and challenge in disaster risk reduction implementation; serves at a more political level.</p> <p>CAPRADE-PREDECAN Monitoring System: directed to the Andean countries, in order to measure governance, the existence or not of regulatory frameworks, planning, and incorporation of risk management plans.</p>

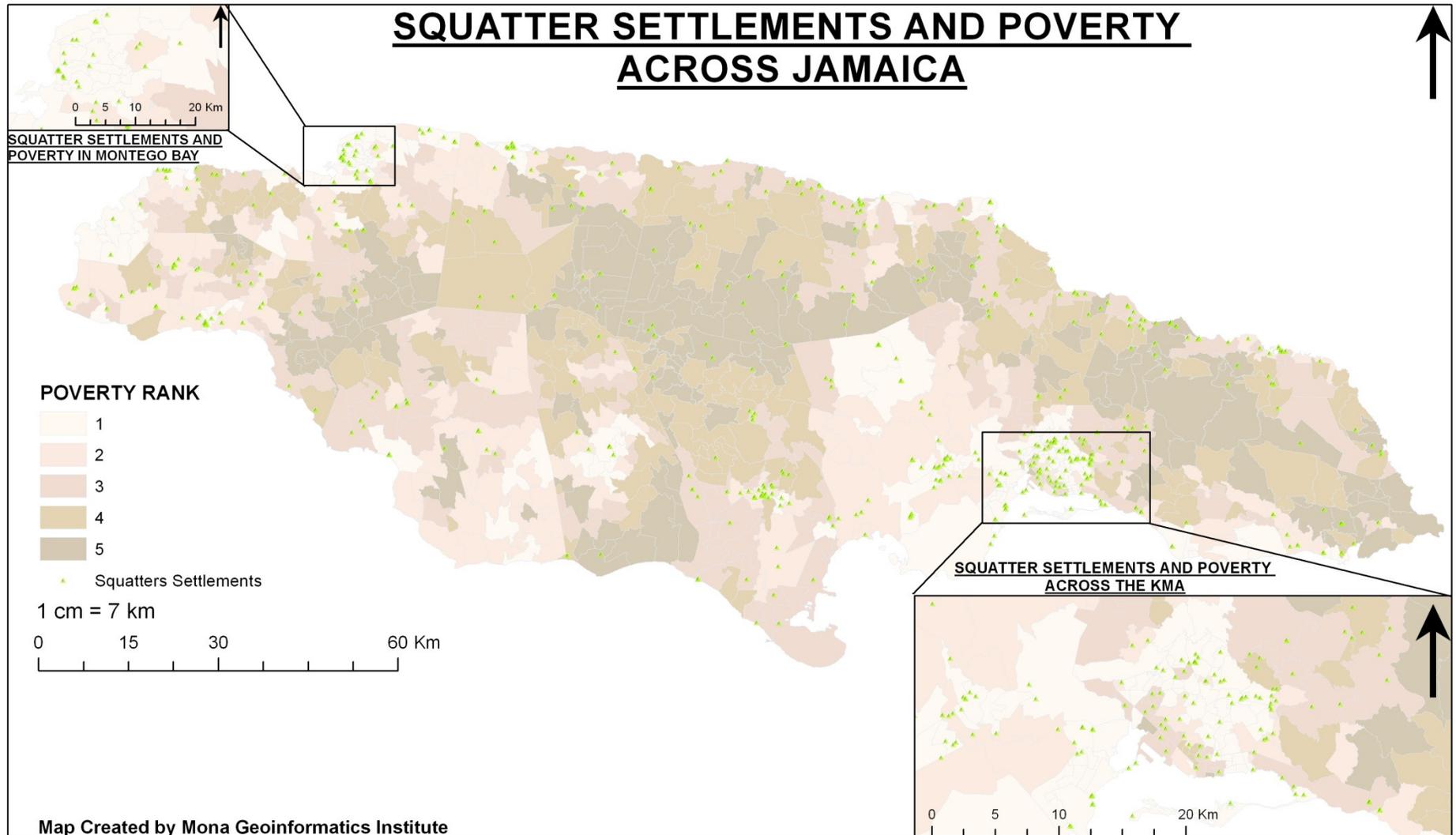
15	<p>General risk laws of the country and the rules governing the national, sub national and sectorial planning in each country systems.</p> <p>HFA Monitor: http://www.preventionweb.net/files/2259_IndicatorsofProgressHFA.pdf</p> <p>CAPRADE-PREDECAN Monitoring System http://www.riesgoycambioclimatico.org/TalerColombiaHyogo/SMOI_CAPRADE_PREDECAN.pdf (in Spanish available)</p>	<p>Law: Conduct a review into the country's laws to determine those related to disaster risk management and planning.</p> <p>HFA Monitor: is a tool that captures information on the progress of the Hyogo Framework for Action; above all, it consists of indicators to monitor and review the progress and challenge in disaster risk reduction implementation; serves at a more political level.</p> <p>CAPRADE-PREDECAN Monitoring System: directed to the Andean countries, in order to measure governance, the existence or not of regulatory frameworks, planning, and incorporation of risk management plans.</p>
16	<p>Compilation of: regulatory bodies or comprehensive laws in risk management, and other standards as decrees, regulations or sectorial laws</p> <p>HFA Monitor: http://www.preventionweb.net/files/2259_indicadoresdepr</p>	<p>Standards: Conduct a review of the country's laws to determine those related to disaster risk management as well to include sectorial laws, decrees and regulations.</p> <p>HFA Monitor: is a tool that captures information on the progress of the Hyogo Framework for Action; above all, it consists of indicators to monitor and review the progress and challenge in disaster risk reduction implementation; serves at a more political level.</p>
17	Country's policies and official plans	Review the plans or programs related to climate change in the country.

18	Risk Management Index (RMI) of the Inter-American Development Bank (IDB) http://www.iadb.org/en/topics/natural-disasters/disaster-risk-indicators/disaster-risk-indicators,1456.html	RMI: Performance measurement of the risk management. It is a quality measurement management based on pre-staged levels or desirable referents (benchmarks) to which risk management, should be directed according to their progress degree.
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Appendix 3: Map of flood and landslide occurrences across Jamaica.



Appendix 4: Map showing squatter settlements and poverty across Jamaica. There is no apparent spatial correlation between squatter settlements and poorer communities.



Appendix 5: Report on application of Criteria to identify key actions for DRR planning

Country: Jamaica

Level of application: National

- 1) Please describe the comments of the National Disaster Management Office to the introduction to the tool “Criteria to identify key action for DRR planning”.

No comments were received – however the office did not object to the tool being applied during the update.

- 2) Provide feedback how the different stakeholders responded to the criteria during the different stakeholder consultations.
(include if the criteria are easy to understand, if stakeholders made suggestions, e.g. to revise criteria or others, if all data required to take a decision on the classification was available).

COMMENTS FROM STAKEHOLDERS:

- a) *Language needs to be simplified to be more easily understood*
- b) *Language is clumsy*
- c) *The tool should be simplified for use at sub-national level*
- d) *Indicators need to be adjusted for relevance*
- e) *Tool provides a standardized approach but may need editing for sub-national use*
- f) *Data was available.*

- 3) Coordinating the application of the tool “Criteria to identify key action for DRR planning” what elements need to be revised in your opinion in the matrix of criteria and its related guidelines?

Guidance could be provided on when tool could most effectively be applied. For example, is it necessary if country has already identified priorities and strategies.

- 4) Did you apply the methodology suggested by UNISDR or did you have to make any adjustments to it? If so, please explain why. In case you applied the suggested methodology, are you suggesting any changes to it?

The method suggested by UNISDR was applied.

- 5) During the national consultation workshop, did stakeholders in general agree with the DRR priorities which were identified based on the consultation undertaken before?

Yes, for majority of the indicators while changes were suggested for the others.

- 6) In summary, was the tool seen useful by the stakeholders? Did they serve the purpose to identify DRR priorities at the sub-national level?

Tool was generally seen as useful and helped identify DRR priorities as stated in document. Strategies inserted were from country's development plan.

- 7) Please provide any other relevant comments that were not yet mentioned in the questions above.

The question was asked as to whether this is meant to replace any other method which has been/will be used to establish priorities at national level.

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